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Automatic Arc Welding in Tank Construction

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The development of arc welding to replace riveting—Welding methods for tanks—Design of tanks to be welded—Strength formulas

THE use of arc welding as a substitute for riveting in the building of tanks has in the past been viewed with a certain amount of distrust by many tank manufacturers. Any new and improved process undergoes the same procedure. For many years rivets have played a stellar rôle in the field of tank construction, but within the past ten years electric welding has developed as a formidable rival, although in many instances welding is still not recognized as a safe design feature.

There are, undoubtedly, several reasons for this distrust. In some cases there may exist a lack of understanding of the fundamentals of the process. Then too, the inertia that must be met in order to effect a change from one standard process to another is often too great to be easily and successfully overcome. It is, no doubt, a costly proposition sometimes to change from a standard procedure to a strange method and the greatest possible savings are probably not always obtained on the first attempt. In most instances, however, the manufacturer must be shown before believing. This situation is natural and is true in many branches of the welding profession today, but this distrust is gradually being replaced by confidence.

As for the arc welding process itself the heat generated by an electric arc is utilized to fuse together the parts to be welded with the addition of metal from a rod or wire called the electrode. This fusing operation occurs very rapidly at the point where the arc strikes the parts to be joined and continues as long as the welding arc is maintained. The metal added from the electrode takes the place of that metal which is oxidized or lost during the operation and also additional metal is usually necessary to insure a thorough fusion between the parts to be joined.

With regard to the material ordinarily used for building tanks the specifications of the A.S.M.E. Boiler Code contain the following requirements for tensile strength of boiler-plate steel:

Tensile strength lb. per sq.in. 55,000-65,000
Yield point lb. per sq.in. 0.5 tensile strength
Elongation in 8 in., $\frac{1,500,000}{\text{tensile strength}}$ per cent

An average figure for the tensile strength may be considered as 60,000 lb. per sq.in. with an elongation in 8 in. of 25 per cent. This material can be successfully welded.

The average experienced hand welder can secure butt welds having an ultimate tensile strength of 40,000 lb. per sq.in. without difficulty. This statement is borne out by a study of the Wirt-Jones tests which were conducted under the auspices of the welding committee of the Emergency Fleet Corporation in 1918. A report of these tests is given in the minutes of the committee for Oct. 17, 1918, page 33. It is interesting to note that out of a total of 16 different tests made with direct current and commercial bare electrodes only four tests were below 50,000 lb. per sq.in. The maximum figure was 62,000 lb. per sq.in. and the minimum 45,000 lb. per sq.in.

With the automatic arc welding process the ultimate tensile strength of the weld is about 50,000 lb. per sq.in. In fact some tests have shown a strength of 70,000 lb. per sq.in. but the figure of 50,000 lb. per sq.in. represents an average minimum. Out of eight tests of welds made by the writer on ½-in. steel boiler plate one test showed an ultimate strength of 47,000 lb. per sq.in. The remainder were well over 50,000 lb. per sq.in.

Welding of Low Pressure Tanks and Containers

The fundamental problem involved when welding vessels subject to pressures of 25 lb. per sq.in. and below is to obtain a uniform weld and a tight joint with the least cost. Not much attention is given to the breaking strength of the joint since the load imposed is usually considerably below the breaking strength of the weld. The low cost of the welded joint and its low upkeep recommend it in all cases. Leakage is eliminated and the tank appearance improved.

Automatic arc welding lends itself very readily to making the longitudinal as well as the seams along the circumference of tanks because it increases the speed of production over the hand welding process and cuts labor costs. Then too, the quality of the finished weld is better, thus reducing the percentage of rejects in the finished product. This latter factor contributes to the saving in material.

In the manufacture of containers of thin sheet metal, automatic arc welding proves very satisfactory. The speed and uniformity with which the welding operation is performed permits of welding thinner material than would be possible by hand welding. Sheet metal as thin as 20 gage (0.038 in.) under proper conditions can be welded with the automatic arc.

Tests have shown that with the hand welding process the average amount of the electrode deposited in the weld is about 70 per cent of the electrode consumed. The amount of electrode wire wasted in the form of scrap ends is about 18 per cent of the total amount of electrode consumed. The remaining 12 per cent is consumed by oxidation in the welding arc and by the

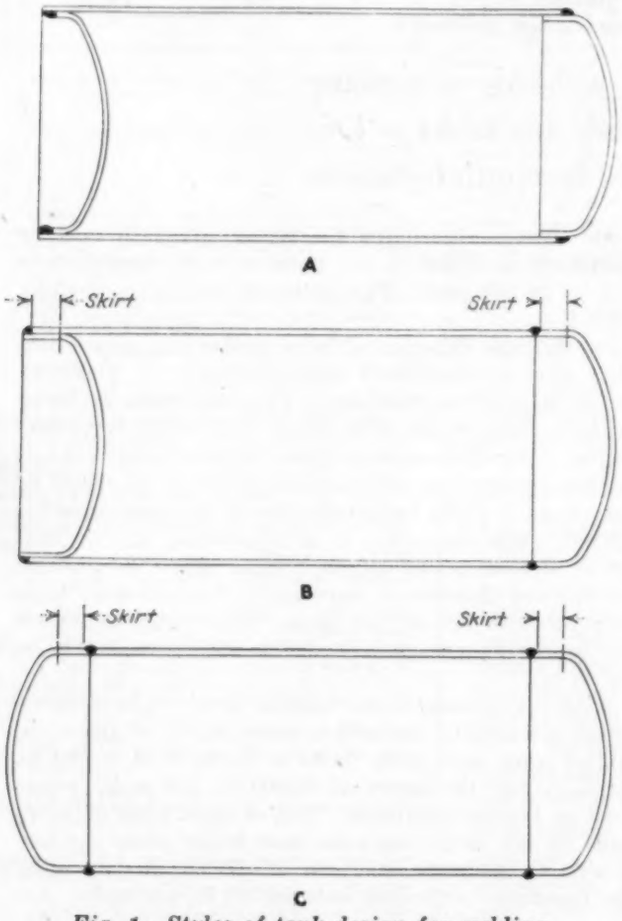

Fig. 1—Styles of tank design for welding

spattering of the metal as it is deposited in the arc crater. With the automatic welding arc there are no scrap ends. The percentage of metal burned up is about 8 or 10 per cent so that the saving in electrode materials is quite an item on steady production work.

Up to the present time electric arc welding has not been extensively used for welding high pressure tanks because the dependability of the arc weld has not been recognized by the authorities. A welded pressure tank is usually regarded with distrust. This attitude is wrong and should be changed, for, while there have been failures of welded tanks, the welding process should not necessarily be condemned as the cause of these failures. A welded tank may fail because of improper design or because the welding was poorly done. The process itself is satisfactory but experienced men are required to successfully apply it.

Usually arc welding has been applied to tanks previously designed for riveting and then welded. This type of tank is shown in Fig. 1 at *A*, in which one head is concave toward the pressure while the other is convex. As will be seen from the illustration the welds are located adjacent to the point where the curved portions of both heads begin. When pressure is applied to the tank the head will begin to deform, especially the head that is convex to the pressure, and this deformation will cause a bending stress to be set up in the weld. Since any joint is weaker in bending than in pure tension or shear this type of weld will fail under lower pressure than a similar joint in a properly designed tank. In other words the tank which is to carry pressure should be designed so that the welded seams are under either pure shear or tension.

If we consider further the relative strengths of a weld when subjected to shearing and tensile stresses we would pick the design of tank shown at *C* as the strongest. In this type of tank the welds are all subject to tension alone while the weld on one head of the tank at *B* is subjected to shearing stresses.

A type of tank is shown at *B* and *C* suitably arranged for welding. It will be noted that in each case there is a certain distance between the weld and the point where the curvature of the head begins. This is used in order to insure a pure shear or tension in the weld, as the case may be, and in this way take advantage of the entire strength of the weld. This distance is called a "skirt" and should vary with the diameter of the tank.

The pressure vessel committee of the American Bureau of Welding conducted an extensive series of tests in 1922-23 and as a result of those tests the following minimum lengths of skirt are recommended.

Inside Diameter of Tank	Minimum Straight Length of Skirt
12 in. and less	1½ in.
12 in. to 24 in.	1¾ in.
24 in. to 36 in.	2½ in.
36 in. to 48 in.	2¾ in.
48 in. to 60 in.	3¼ in.

Formulas for Design

As has been previously explained the average experienced hand welder will secure welds having a minimum tensile strength of about 40,000 lb. per sq.in. With the automatic arc welding process the ultimate tensile strength will be about 50,000 lb. per sq.in. although with a skillful operator, welds of 60,000 lb. per sq.in. and over may be obtained. Using these two former values for hand welds and automatic welds and assuming a type of construction as shown by Fig. 1 at *C*, we may derive the following formulas:

Let P = working pressure in the tank in lb. per sq.in.
D = diameter of the tank in feet
t = thickness of tank wall in inches

Then, $P = 2C \times \frac{t}{D}$ (circumferential seam)

and $P = C \times \frac{t}{D}$ (longitudinal seam)

where C is a constant and has a certain numerical value depending on the safe load allowable on the welded seam which is in itself dependent upon the factor of safety employed and whether hand welding or automatic welding is used.

Assume the use of hand welding and consider the circumferential seam. The area of cross-section of the tank with diameter D is $\frac{\pi D^2}{4}(144)$ in square inches.

The pressure on the head of the tank will therefore be $36\pi PD^2$ in lb. The area of the weld in the circumferential seam which is holding the head in place is $12\pi Dt$ sq.in. and the total safe load which this welded seam may carry, assuming a factor of safety of three, is $12\pi Dt\left(\frac{40,000}{3}\right)$ or $4\pi Dt(40,000)$. Now, since the load on the head of the tank must be balanced by the safe load on the weld, we have

$$4\pi Dt(40,000) = 36\pi PD^2$$

$$P = \left(\frac{40,000}{9}\right)\frac{t}{D} \text{ or } P = 4,444\frac{4}{9} \times \frac{t}{D} \qquad (1)$$

If now we consider the longitudinal seam we find that on a unit section of the tank 1 in. long the load will be $12PD$. On one linear inch of the longitudinal seam at one side of the tank the load will then be half this figure or $6PD$. Now the area of 1 in. of seam will be t square inches. The allowable load on this amount of seam with a factor of safety of three will be $\left(\frac{40,000}{3}\right)t$. Equating the two forces which must necessarily be equal, we have

$$6PD = \frac{40,000}{3}t \text{ or}$$

$$P = 2,222\frac{2}{9} \times \frac{t}{D} \qquad (2)$$

For an automatically arc-welded tank where the welded seam has an ultimate strength of approximately 50,000 lb. per sq.in. these formulas become respectively

$$P = 5,555\frac{5}{9} \times \frac{t}{D} \qquad (3)$$

and

$$P = 2,777\frac{7}{9} \times \frac{t}{D} \qquad (4)$$

of which 4 is the formula that should be used.

Values of the Constant C

From a study of formulas 1 and 2 just derived, we note that the safe working pressure based upon a certain breaking strength (in this case 40,000 lb. per sq.in.) in the longitudinal seam is just one-half of the safe working pressure which would be allowed for the same breaking strength in the circumferential seam. From this data we can, therefore, conclude that the circumferential seam, due to its position in the pressure vessel, will stand approximately twice the working pressure that the longitudinal seam will stand for the same stress in the weld. This means that in designing a pressure vessel for welding we must use formula 2, which is dependent on the longitudinal seam. In this way we should expect failure to occur in the longitudinal seam before the circumferential seam.

TABLE FOR VALUES OF C

Kind of Joint	Value of C in formula 2 — Fact. Safety 3	Fact. Safety 4	Fact. Safety 5
Hand weld.....	2,222⅔	1,666⅔	1,333⅓
Automatic weld...	2,777⅞	2,083⅓	1,666⅔
Seamless shell.....	3,055½	2,291⅔	1,833⅓

As has been stated before, the numerical values of C vary, depending upon the ultimate strength of the weld and the factor of safety employed in the design of the tank. Assuming that we use a factor of safety of four, then formula 2 becomes

$$P = 1,666\frac{2}{3} \times \frac{t}{D} \qquad (5)$$

which gives the safe working pressure with a factor of safety of four on a hand-welded tank.

The accompanying table gives the numerical values of C for various conditions. It will be noticed from the table that the values of C are greater for the automatic weld and the seamless shell than the values for hand welding. This condition is determined by the ultimate strengths of these two types of construction. The ultimate strength of the automatically welded seam has been taken as 50,000 lb. per sq.in.; that of the seamless shell as 55,000 lb. per sq.in., which is the minimum as specified by the A.S.M.E. Boiler Code.

(To be concluded)

Recommended Practice for Interchangeable Gears

At the fall meeting of the American Gear Manufacturers' Association, held at West Baden, Ind., a modified 14½-deg. involute-curve system for interchangeable gears was adopted as recommended practice.

In Fig. 1 is shown the mathematical definition of the basic rack adopted as recommended practice by the association. This rack has been tested by making tools according to its specifications from which gears were developed that ran successfully with gears made with cutters purchased in the open market.

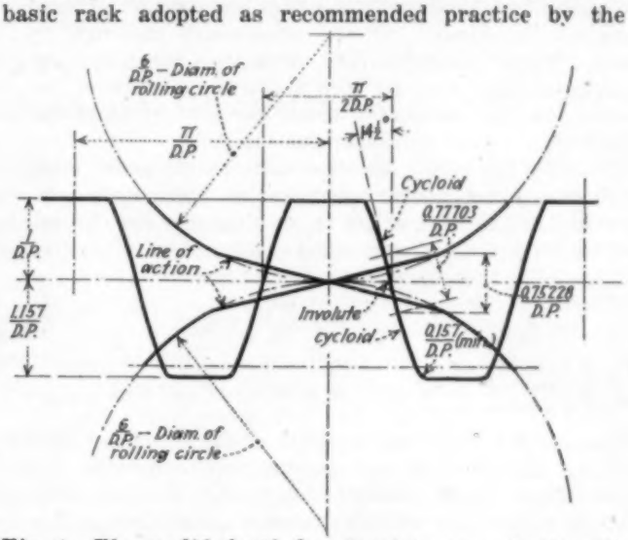

Fig. 1—The modified 14½-deg. involute-curve basic rack

A close approximation to this basic rack is shown in Fig. 2. This form is more easily reduced to templet or cutter form than the preceding one. Gears cut from these racks closely resemble those in the Brown & Sharpe system and are correctly interchangeable, but it is not claimed that this basic rack will generate gears known as Brown & Sharpe gears.

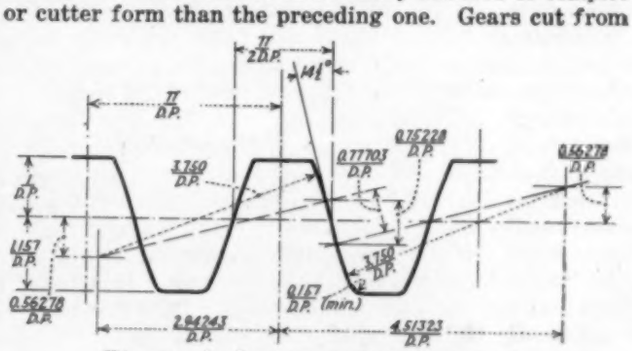

Fig. 2—A close approximation to the mathematical design

Recommended Practice for Steel Castings for Gears

At the October 1–3 meeting of the American Gear Manufacturers' Association, held at West Baden, Indiana, the following recommended practice for steel castings for gears, reported by the Metallurgical Committee, was adopted:

GENERAL: It is recommended that steel castings for cut gears be purchased on the basis of chemical analysis, that only two types of analysis be used, one for casehardened gears and the other for both untreated gears and those which are to be hardened and tempered.

PROCESS: The steel is to be made by the open-hearth, crucible or electric-furnace processes. The converter process is not recognized and its use is to be only by private arrangement between the interested parties.

DISCARD: Sufficient risers shall be provided to secure soundness and freedom from undue segregation. Risers shall not be broken off the unannealed castings by force. Where risers are cut off with a torch the cut shall be at least one-half inch above the surface of the casting, and the remaining metal removed by chipping, grinding, or other non-injurious method.

HEAT-TREATMENT: All steel castings for gears must be thoroughly normalized or annealed, using such temperature and time as will entirely eliminate the characteristic structure of unannealed castings.

CHEMICAL COMPOSITION:

Use	Carbon	Manganese	Phosphorus—Acid	Phosphorus—Basic	Sulphur
Class C Casehardening..	0.15—0.25	0.40—0.60	0.06 max.	0.05 max.	0.06 max.
Class H {Untreated or Hardened:}	0.30—0.40	0.40—0.60	0.06 max.	0.05 max.	0.06 max.

LADLE ANALYSIS: An analysis of each melt of steel shall be made by the manufacturer to determine the percentages of the elements specified. This analysis shall be made from drillings taken at least one-quarter inch beneath the surface of a test ingot obtained during the pouring of the melt. The chemical composition thus determined shall be reported to the purchaser or his representative, and shall conform to the requirements specified.

CHECK ANALYSIS: Analyses may be made by the purchaser from one or more castings representing each melt. The chemical composition thus determined shall conform to the requirements specified above. Drillings for analysis shall be taken at any point not closer to the center than midway between the center and the surface, but not within one-quarter inch of the surface of the casting.

FINISH: (a) The castings shall conform substantially to the shapes and sizes indicated by the patterns or drawings submitted by the purchaser. When dimensioned drawing are provided, the foundry shall take all responsibility for correctness as to shrinkage.

(b) The castings shall be free from injurious defects and have a workmanlike finish. Defects which do not impair the strength of the castings may with the approval of the purchaser or his representative, be welded by an approved process. The metallic electrode method of electric welding is an approval process. No welding shall be done in a manner to conceal defects. The defects shall be cleaned out to solid metal before welding, and when so required by the inspector, shall be submitted to him in this condition for his approval. All steel castings welded by the foundry shall be heat treated after welding before delivery to purchaser.

MARKING: The melt number and foundry symbol shall be legibly stamped or cast on each casting six inches or over in thickness or diameter and on castings of smaller section when so specified.

INSPECTION: (a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the castings ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the castings are being furnished in accordance with these specifications.

(b) If in the case of important castings for special purposes, surface inspection in the green state is required, this shall be so specified in the order.

(c) All tests (except check examination for analysis and annealing) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

REJECTION: Castings which show injurious defects or fail to pass check examinations subsequent to their acceptance at the manufacturer's works will be rejected and the manufacturer shall be notified.

REHEARING: Samples tested by the purchaser which represent rejected castings, shall be preserved for two weeks from the date of the test report. In case of dissatisfaction with the results of the tests the manufacturer may make claim for a rehearing within that time.

How Not to Ask for an Appropriation

A works engineer had worked out a plan for a plant improvement which involved the purchase of some new equipment. According to his figures it would be possible to improve the working conditions considerably and to decrease the costs of manufacture. In fact he could see where the investment could be paid for out of the savings within a two-year period.

The rules of procedure in the company required that a report covering all of the essential points of a proposed improvement accompany each request for an appropriation so the engineer wrote one in detail and used every effort to make it complete and impressive. He decided that the best impression could be made by exhibiting his knowledge of engineering in general and of the problem in particular. He felt that by putting this knowledge across strongly enough he would impress the directors favorably long before they ever reached the point of questioning the amount involved.

The report came before the directors in due time. One of them started to read it to the others but did not get more than partly into the first page before he was asked to stop and send the report back to have the facts dug out of the language that, as they were not engineers, they had no way of understanding.

The appropriation was not granted simply because the engineer failed to understand that financiers are interested in engineering only so far as the difference between outgo and income is concerned. To bury or precede the statement is to invite their disapproval.

Automotive Production

A New Automobile Shop

By John Younger
Associate Editor, *American Machinist*

Rejuvenation of the Mitchell plant—All tools are motor driven—The progression system for handling parts—Machining and production methods

THE Ajax Motors Co., Racine, Wis., finds itself in a fortunate position, having bought the Mitchell plant of that city, which it was able to completely divest of its machinery and where it installed entirely new equipment throughout. This machinery was purchased and set up during the latter part of 1924 and the early part of 1925. The wheels began to turn for production in May, 1925, so the plant may logically be looked upon as the last word in modern manufacturing plants.

The buildings themselves were brought up to date in many ways. A two-color paint scheme is used throughout the shops. White is used for the upper part of the walls, while the lower four feet is covered by a light gray paint. A very generous supply of daylight illumination is furnished by the northern light in the single-story, sawtooth roof. Artificial illumination is supplied by 100-watt electric lamps equipped with light-diffusing deflector shades spaced 10 ft. apart at a height of about 10 ft. from the floor. There are practically no main shafts or countershafts with their driving belts to obstruct the illumination of the shop.

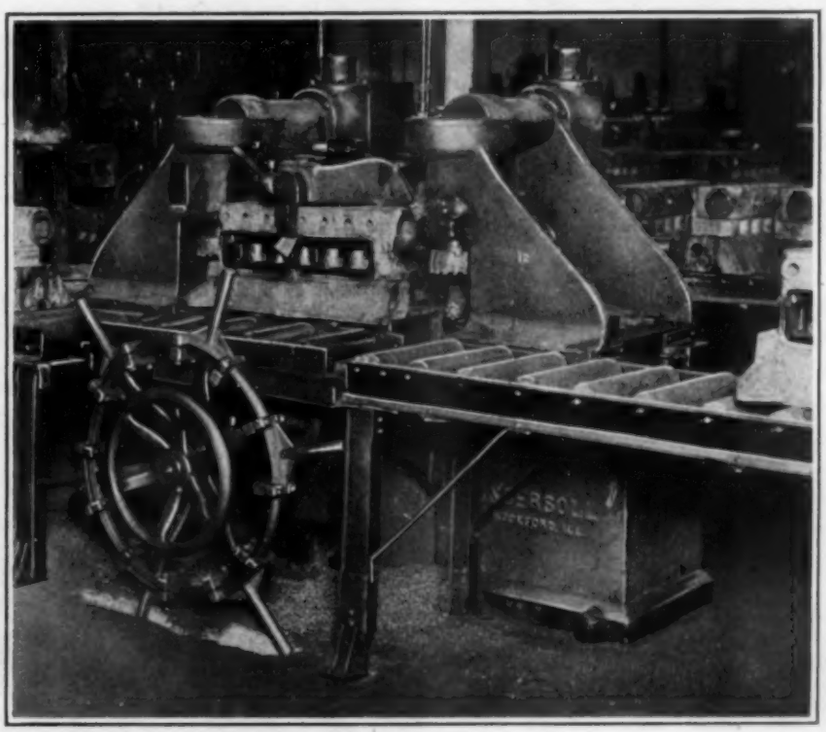

Fig. 1—Milling locating spots

Almost all machines are driven by individual electric motors, the one noteworthy exception being a line of eight Baker drilling machines used for the cylinder block and driven from one shaft. In passing, this feature might be noticed as a tendency in modern shops and can be traced largely to the specialization to which the equipment of mass-production shops is being subjected.

The initial design of the Ajax car had been tested out very thoroughly so that production with many specialized tools was entered on with confidence, although there are also a large number of modern types of standard machines in use. The company manufactures a great number of parts including the engine, the front and rear axles, the transmssion, the brakes and brake rigging, the clutch, and the necessary frame equipment.

It should be noted that the plant is under the control of C. W. Nash, himself a master production man of long experience, with D. C. Averill, also of long experience, as president, and with W. G. Cariens directly responsible for the equipment.

The labor situation is also worth noting. Racine, a city whose population is about 80,000, is

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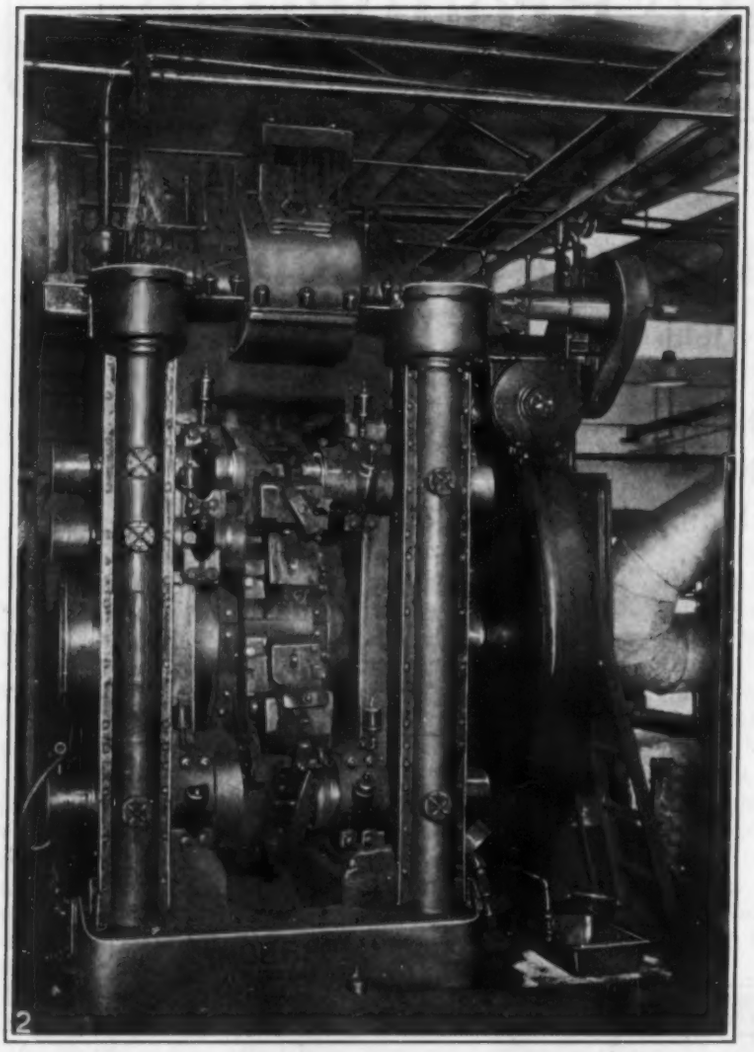

Fig. 2—Drum-type machine for top and bottom faces

situated very pleasantly on Lake Michigan. It is one of the numerous manufacturng towns lying in the Chicago and Milwaukee zone and its population consists largely of people of a permanent type, who own their homes. Group piecework is the system of wage incentive used and it is proving very successful.

Practically all the work in the shop is arranged according to the straight-line, progression system of handling. The material is received at one end and passes in a regular sequence of operations down the shop until the assembling line is reached. A notable instance of this progression system, which makes for exceedingly economical manufacture, will be touched on in detail later. The heat-treating furnaces and their necessary oil and water tanks are placed in the transmission-gear line of progression, between the gear-cutting and the grinding machines. Possibly the only exception to adherence to this system occurs in the case of small case-hardened parts such as spring-shackle pins and the like, which leave the machine shop and travel a comparatively short distance to the carburizing furnaces and thence back to the machine shop for finish grinding.

The most complex piece of work, from the standpoint of number of operations and their importance, is undoubtedly the cylinder block. This piece is made of cast iron, and the cylinders, six in number, are integral with the upper half of the crankcase, thus introducing a variety of operations. During the sequence of operations, the block travels on roller-type conveyors and wherever desirable, a simple air-hoist is used for loading and unloading the work on the machine although the block is such that two men can easily lift it.

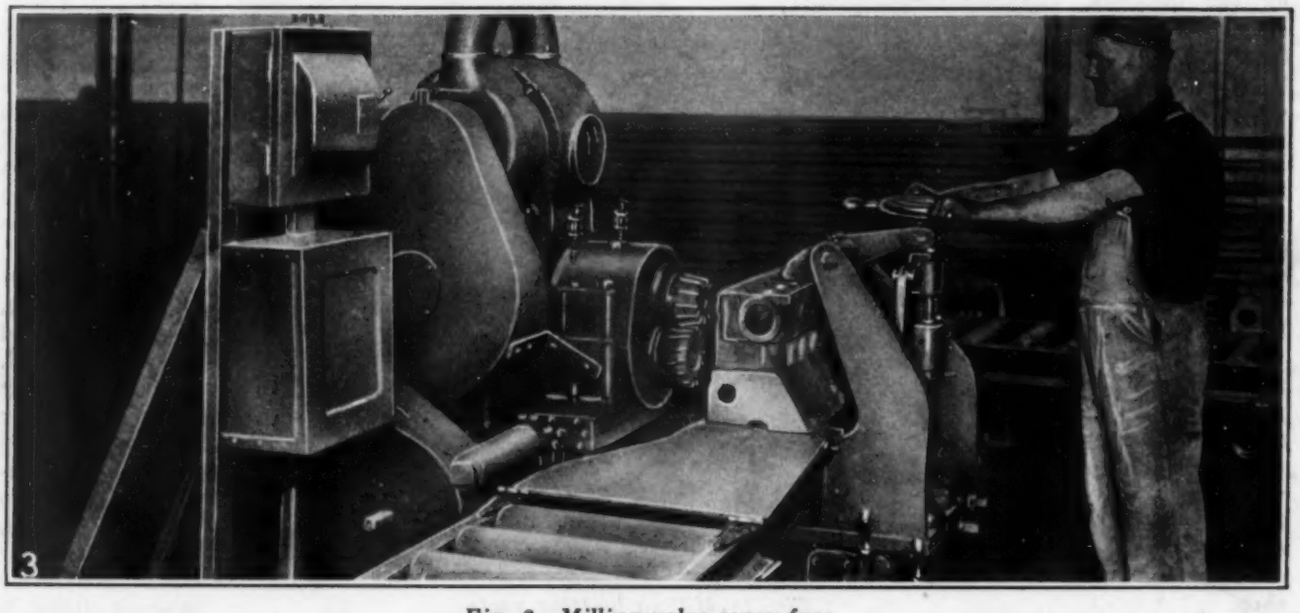

Fig. 3—Milling valve-cover face

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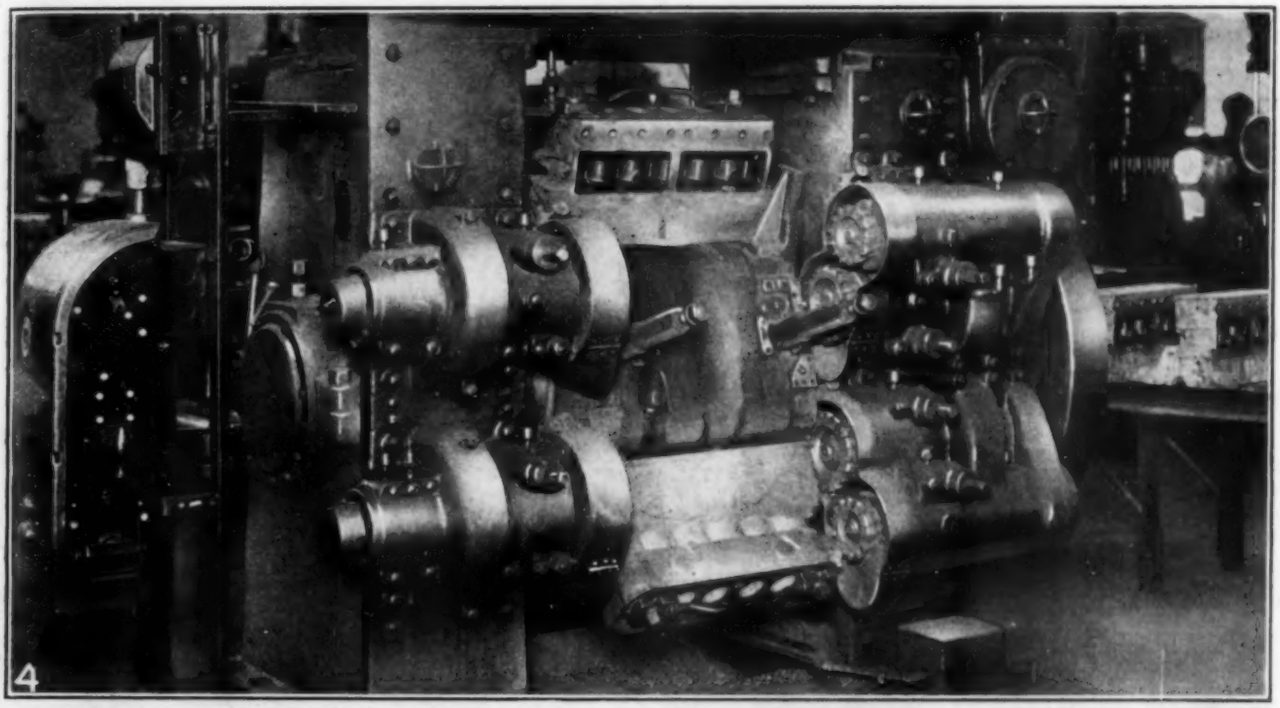
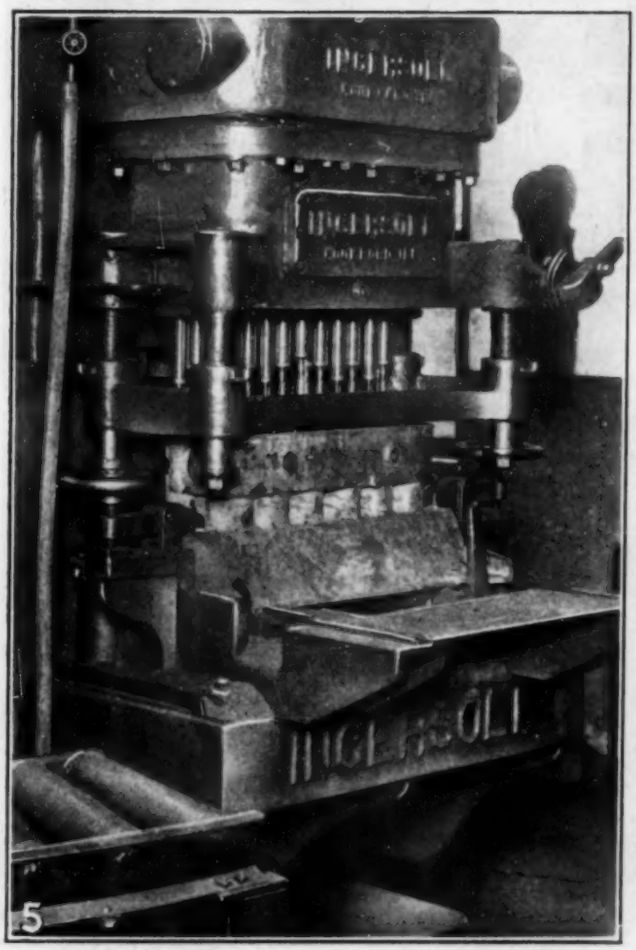




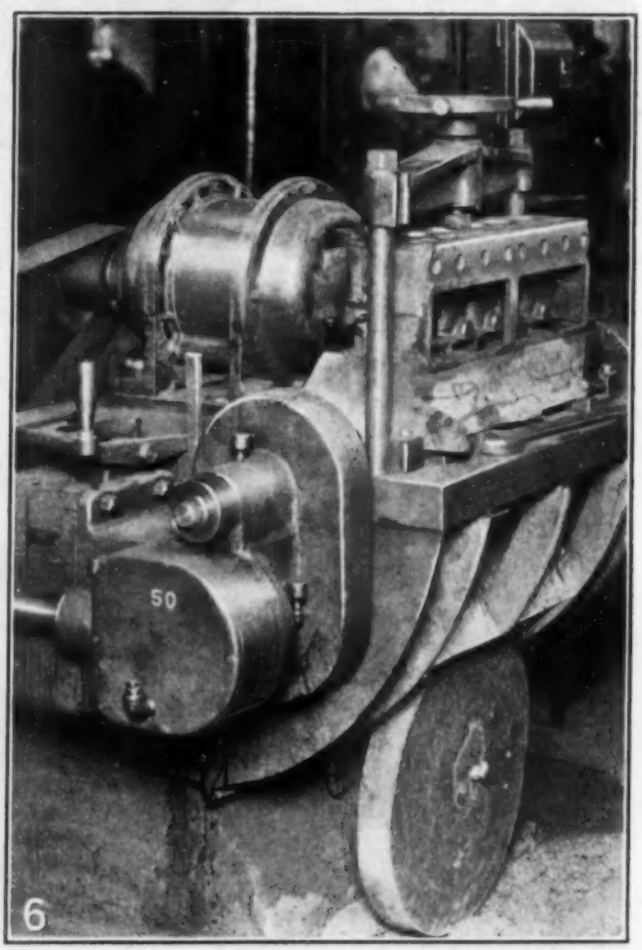
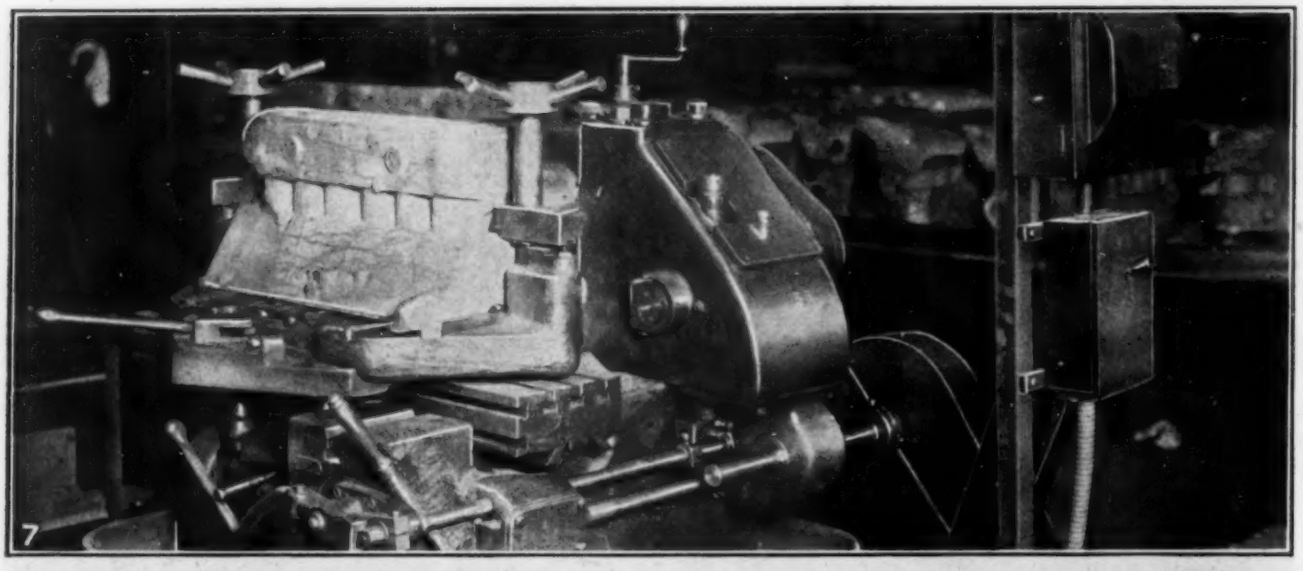
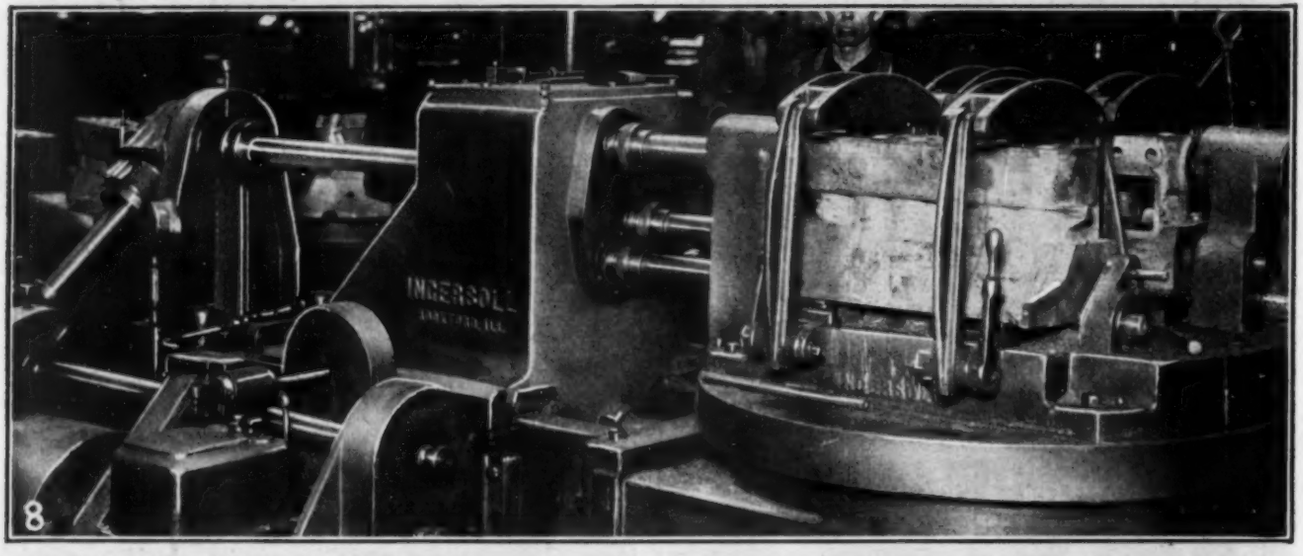


Fig. 4—Milling ends of casting on drum-type machine. Fig. 5—Drilling valve-guide and water holes
Fig. 6—Straddle-milling bearing faces

AUTOMOTIVE PRODUCTION





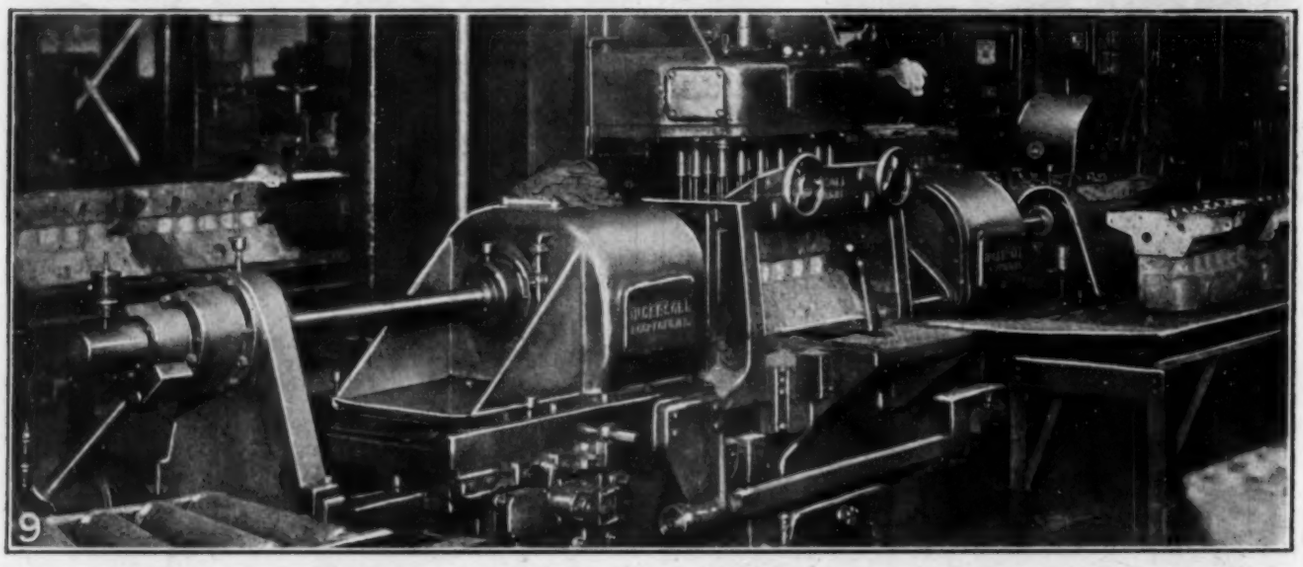


Fig. 7—Milling faces for valve-cover studs and tappet-carrier brackets. Fig. 8—Rough-boring main bearings
Fig. 9—Multiple drilling

AUTOMOTIVE PRODUCTION

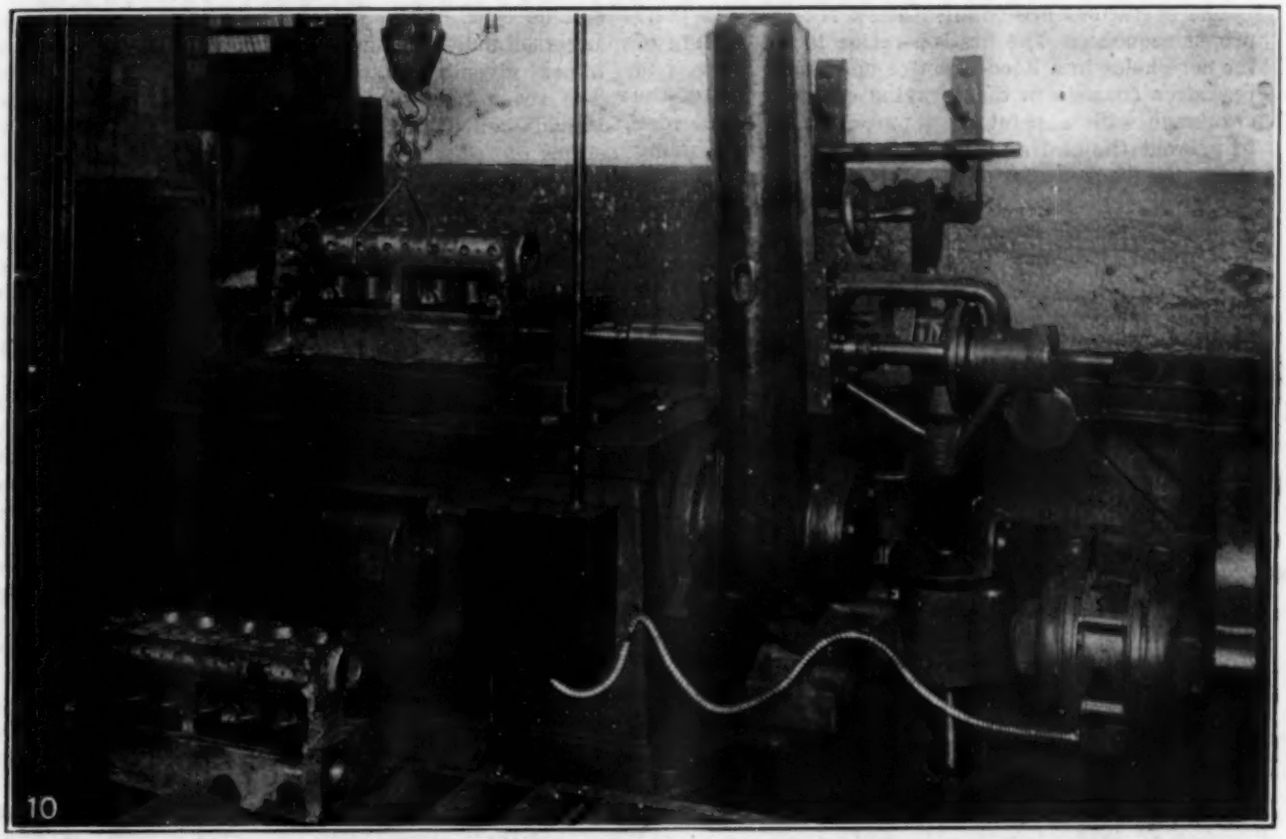


Fig. 10—Line-reaming cam bearings. Fig. 11—Finish-reaming cylinders

AUTOMOTIVE PRODUCTION

The operations are detailed below for study in their proper sequence. The first operation is the drilling of the core holes in a Reed-Prentice machine. The second operation consists in the spraying of the inside of the crankcase with a paint of a pyroxylin base in order to prevent the casting from rusting or scaling during the subsequent operations. Next comes the spotting of the proper casting thickness in a special Ingersoll machine, Fig. 1. The drilled core holes are used as the primary locating points and milling tools then machine six locating spots, three at each end of the block in the three normal planes. The cylinder-head and the crankcase faces are then milled in an Ingersoll drum-type machine. The drum carries six fixtures. The blocks are loaded and unloaded on one side of the machine, located on the surfaces machined in the previous operation, and held in place by clamps. The drum rotates continuously and carries the blocks past roughing and finishing cutters both of which are of the inserted-tooth type. Fig. 2 shows how the micrometer adjustments are available on the tool heads to give the requisite accuracy to the cuts.

The fifth operation is the drilling of the two final locating holes in the crankshaft flange on a 21-in. Aurora drill press. The holes are $\frac{3}{8}$ in. in diameter and are as far apart as possible in order to serve as locating points in all subsequent operations. The sixth operation is done on an Ingersoll machine as shown in Fig. 3, where the milling cutters traverse the valve-cover and manifold faces. The seventh operation

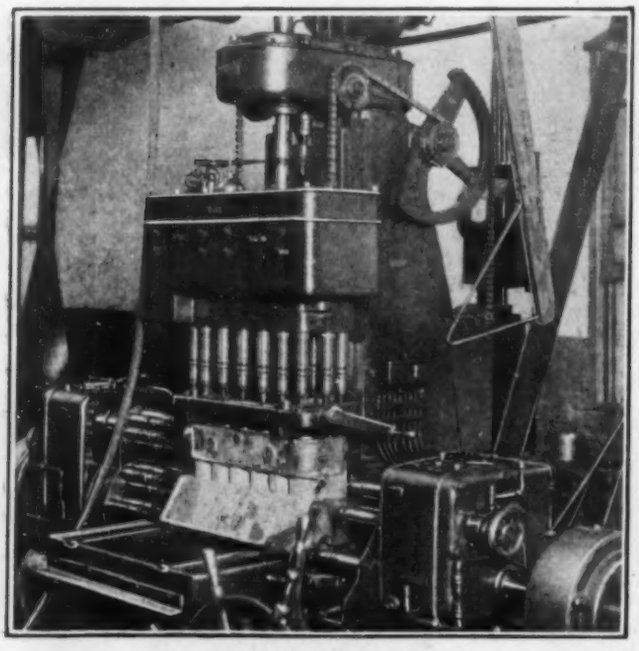


Fig. 12—Multiple tapping

is the milling of the end faces, including the flywheel-housing face and the face for the cover of the timing-gear, which is done on another drum-type Ingersoll machine, Fig. 4, similar to that used in the fourth operation.

As the eighth operation the cylinders are bored in one of the Moline "Hole Hog" drilling machines of the six-spindle type. Then the water holes are drilled in an Ingersoll multiple-spindle machine, Fig. 5. The casting is next given a test to make sure that it is water-tight. The seven bearings for the crankshaft bushings are straddle-milled in a Newton machine, Fig. 6. The two series of faces for the tappet-carrier brackets and the valve-cover studs are recessed and milled, as in Fig. 7, on a special Cincinnati machine.

The next operation, number thirteen, is a major one. The crankshaft and the camshaft holes in the lower part of the block are bored on an Ingersoll machine, Fig. 8. At the same setting, the fan and water-pump holes are bored near the top of the block. The fixture used in this case is of the two-station type.

A multiple-spindle, three-plane Ingersoll drill, Fig. 9, is used to bore the cylinder-head stud holes in the engine block. In the fixture used in this instance, the block slides onto cam rollers which are then turned. The block is next lowered over the locating studs and locked in place with hinged clamps. Operation fifteen is a very similar one, but this time the block is elevated to locate on the studs in the fixture in order to drill the crankcase flange holes.

A Foote Burt machine is used for operation sixteen which is the drilling of oil-pump and distribution-shaft holes. The block then proceeds to a Moline "Hole Hog" machine which finishes the twelve valve seats at one time, and thence the block goes to a Carlton radial drill on which the oil holes are bored. A rotating jig and fixture is used on this machine so that three faces can be presented in turn. A rotating fixture is used again in operation on a Cincinnati Bickford drilling machine.

Some counterboring is done on an American Tool Works Co. radial drill and thence the block goes to the twenty-first operation in which the crankshaft-bearing holes are reamed with a special Barnes machine, Fig. 10. The table of this tool swivels around to allow the loading of the work. This method is said to be quicker than that of dropping the head, and the whole machining takes the place of the usual hand-reaming operation.

The second boring operation on the cylinders is performed on a Moline "Hole Hog" machine, after which the block passes through several minor drilling operations until it is brought to a line of eight Baker single-spindle drills, Fig. 11, where each set of cylinders is finished on a certain drilling machine. The object of this procedure is to make sure that each cylinder bore in a block is an exact counterpart of every other, and it is felt that the individual reaming of the six bores is the best way to achieve this uniformity. At this point the conveyor passes a group of machines that are fed by sub-conveyors at right angles to the main system. Here two Foote Burt machines, Fig. 12, tap the various holes where it is specified and another Foote Burt machine, using a 120-grade carborundum stone, hones the bores one at a time.

Washing the casting in a Crescent automatic conveyor and a second test for leakage complete the operations on the cylinder block except for the usual inspection and a final gasoline immersion before passing to the assembling department.

Common Pitfalls of Patent Ownership

By H. A. Toulmin, Jr.

Who owns the patent?—Inventions made by employees—All business relations should be the subjects of written contracts—Decisions by the Supreme Court

PATENT contracts, or the lack of them, often cause the most expensive leaks and losses incident to manufacturing. The actual loss of inventions and the time and money spent in litigation, constitute the most obvious and serious losses. A knowledge of the legal rules and of the reactions of human nature to situations developing from patent contracts, would enable a workable document to be drawn that would prevent disputes and litigation.

Failure to draw up such an agreement between manufacturers and their employees, is responsible for a large part of the disputes that have to be settled by the Patent Office and the Courts. Yet the law is quite clean cut and well determined on the subject. Carefulness would eliminate most of the losses and litigation costs.

That no business relation is so simple that it can safely be left unwritten is shown in the following case: An inventor of machinery who had not been brilliantly successful, sought additional capital. The man who finally furnished the money, naturally, thought he was to be a partner. It turned out, however, that the verbal agreement was not a partnership according to the Patent Office's point of view, but, instead, was an arrangement by which the new man loaned money to the inventor and went to work for him as an employee to carry out certain special work for the inventor in his shop.

During this association, the man who thought he was a partner, actually first thought of a very important improvement which made the invention successful. After leaving his employer, he filed application for a patent on his improvement. His former employer had also filed an application for a patent on the same improvement.

The Patent Office finally decided that even though the man who thought he was a partner, had made the invention first, yet the fact that he was working under the direction of the inventor-employer, would carry the presumption that the employer really made the invention.

This is a technical rule that is often unjust. Many people think it ought to be changed. But it is the law as applied in the Patent Office, and is one of those rules that must be specially known if it is to be guarded against, since there is little logic behind it. This rule is characteristic of a good many rules of the law that are based upon broad matters of public policy, rather than individual justice.

There are, however, several sides to the employer-employee relation which are worthy of note, since the rules, logical or not, are well established. Take the case of a workman who develops a valuable invention in his employer's time, using his employer's tools and materials. This is an indirect contract relationship of employment, which pledges the inventor to give the manufacturer the right to use the invention in his shop. The manufacturer, however, has no right to use the invention anywhere except in his own shop. In fact, the manufacturer's right is so limited, that if he moves away or sells that shop, he cannot take the right to use the patent with him.

> ALL persons engaged in manufacturing, whether they be employers or employees, should know something about patent law. Employees who make inventions, should have written contracts with their employers regarding the ownership of patents, and stating what remuneration, if any, should be received by the inventors for the right to use them.
>
> Absence of such agreements often leads to hard feelings on both sides, and sometimes to an expensive suit at law.

Let me cite a number of cases to show how many variations may arise under this employment relation: An inventor was employed at a stated salary to devote his time to the development of a process in a machine for the production of a front spring, used by the Ford Motor Car Co. He made the inventions and then endeavored to claim that they were his and that the company for which he was working had only a license to use these improvements. The Supreme Court of the United States held that the improvements belonged to the employer absolutely. This is a typical case of an employee endeavoring to secure compensation for the same job twice, by being paid for making inventions and then trying to own the inventions also.

In this case, the employee was hired for the specific purpose of making a certain invention. In the following one, the invention was made as a side issue, by a man whose duties did not include inventing. He thought up a new type of electric sadiron, together with a process and apparatus for making it. He developed the invention in the company's time and with its tools, and with the assistance of other of its employees. He permitted the company to use these inventions without any claim for compensation as an inventor. The court held that the company clearly had the right to use the inventions throughout the life of the patents, and to an extent commensurate with the extent and growth of its business.

Based, perhaps, on such rulings as this, one company sought to ignore the provisions of an agreement it had made with an employee, by which the employee was to receive royalties on any inventions he made, in addition to his salary.

The employee sued for royalties under this agreement, and the Court held that even though the inventor was in the company's employ when he made the invention, there was no reason why such an agreement was not valid. The fact that the materials and facilities for making the invention or perfecting it, were furnished by the employer, did not alter the case, and the court said that this was not an inconsistent relationship, and that it was perfectly possible for the inventor to sue for such royalties and secure them, when there was agreement to that effect, and that he should have the royalties in addition to his salary.

The Legal Distinction

The courts have drawn a distinction between what belongs to a mere employee who makes an invention while working for a company, and what belongs to an executive who may be working for the same company. In a recent case, an executive, hired to make the business successful, and to make improvements in articles made by the company, made an invention in his own time. The court said that he was unlike an employee whose invention made on the outside would be his own. In this case, it was held that the executive held a position of trust with the company and should, in equity, turn over his improvements to the company.

If, however, the executive is the principal executive of the company, the case may be different. The head of a company making stokers took out a patent on furnace apparatus, which was in the line of the manufacture of the company. After a contest, the courts decided that he owned the patent and that the company was not entitled to use the invention. The same result was arrived at in another case, in which the inventor was the general manager, and an officer of the corporation, when the invention was made.

Before a company is entitled to take the inventions of an inventor-employee, it must be shown that the employment relates to the subject matter of the invention involved. The mere employment of a workman does not entitle the employer to claim the inventions made by him. In the absence of any express contract on the subject, the employee has a right to the inventions, and owns them subject to any shop right the company might have, under certain conditions.

It is not necessary, however, that the contract be in writing, since the very circumstances of the employment, as for instance the employment of a man at the head of a designing room, may indicate that his employment was for the specific purpose of design and development. It is, however, unwise to rest upon any such assumption, for the facts may upset the plan.

Contracts of employment that are entered into without thought of invention may, it is apparent, result in a very serious loss to one or both parties, and give rise to a plausible but expensive controversy. It is customary in many concerns to have employment contracts carefully drawn, forming part of the employment card which every employee, no matter how humble, signs when he enters the employ of the company.

This is a very wise precaution, since the agreement can be thus secured that is fair to both parties at the initial stages of the employment, but which could not be secured without loss, or law suit, later. But suppose such a contract is entered into merely by way of employment, and the employee, conceiving a brilliant idea in the line of business of the employer, develops the invention in his own time and with his own materials at home.

Has the manufacturer any rights in this invention?

The courts have held that this situation gives the manufacturer no claim over the invention at all, since the employee has a right to his ideas, provided he uses his own time and materials to develop them. This holds, even though the invention may be in the line of work of the employer. Many employers feel that this is a great hardship, because the man really gets the ideas while working in the shop, and benefits by the education and advantage afforded in the shop, to observe and get experience. He may then capitalize all this on the outside and sell his idea to a competitor.

The question often arises, "How is it possible to tie up the employee so that he will turn over his ideas and inventions to the company?" A special contract for this purpose is necessary. The employee must either be tied by special contract, or hired, by an unwritten contract, or a written one, for the purpose of inventing.

If he is hired for this purpose, of course, everything he does in the line of the company work belongs to the company. But even here, if he invents something that is not in the line of the company's manufacture, even though it might like to get into the line in which the inventor is working, yet it cannot hold the invention.

Dies for Forging Machines

By E. G. Hildebrant

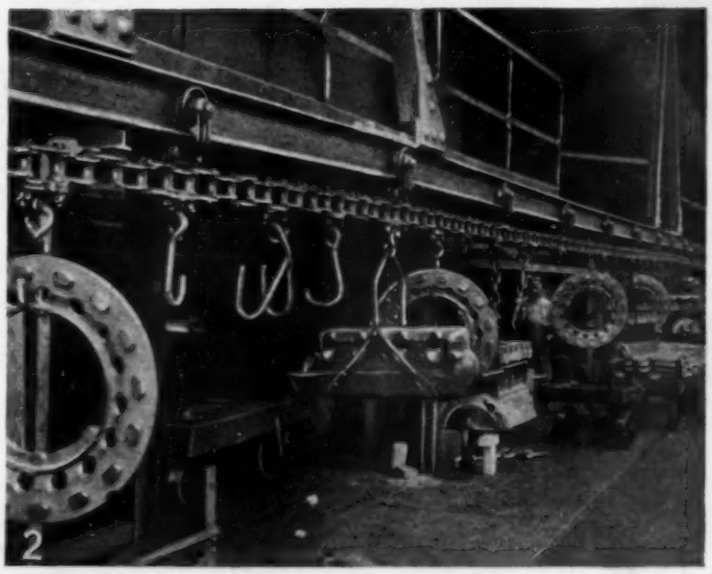
The use of forging machines equipped with proper dies, is resulting in the replacement of parts formerly made of cast iron and cast steel by forgings of greater strength and at a lower cost than can be obtained by hand forgings. The success of forgings, however, depends upon the design, construction and proper alignment of the dies in the forging machine.

The principal causes of die deterioration are abrasion and pressure. The skill of the designer plays an important part in the kind of dies where abrasion has a minimum opportunity to develop. Constant cooling of the dies by jets of water will help to reduce abrasion, both by reducing the temperature and working the scale out of the dies. Where dies are subject to a great amount of heat from continual use, they should be made of steel with high heat-resisting qualities.

Cast-iron dies have their place, however, since there are certain forging operations, such as welding in dies, where cast iron gives better results than steel. There are also instances where only a small number of forgings are required, and where cast iron would be the logical material to use.

Co-operation between the forge shop and the toolroom goes a long way toward reducing the cost of maintenance, and assists in the designing of new dies. The exchange of ideas between the two departments is always helpful. The skill of the operator also enters into the economical production of intricate forgings, and a first-class man should always be assigned to work of this kind in order to secure best results.

Extract from a paper presented at the Convention of the American Railway Tool Foremen's Association, Chicago, Ill., Sept. 2-4, 1925.



Carrying Work to the Workers

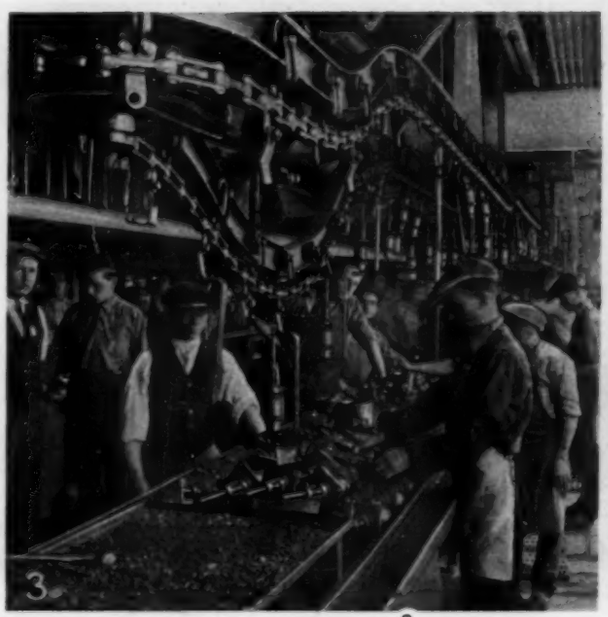
1—Fordson parts on gravity conveyor

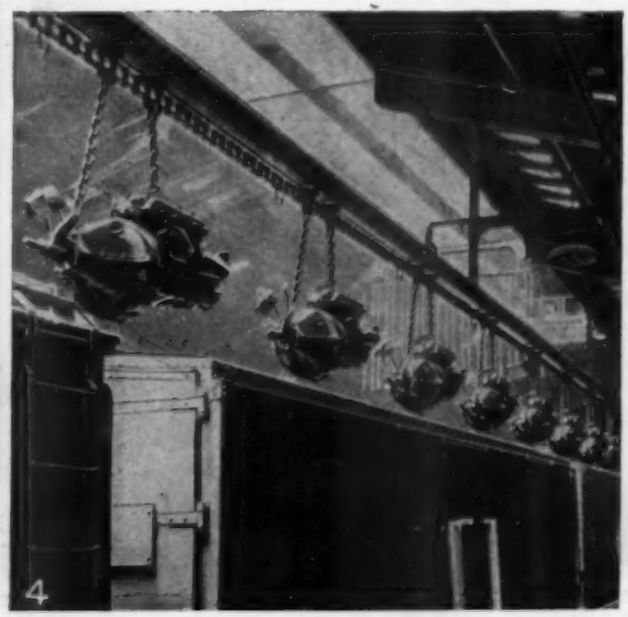
2—Conveying miscellaneous parts in the open

3—Electrical-units conveyor

4—Carrying motors out of everyone's way

Photographs by courtesy of the Ford Motor Co.





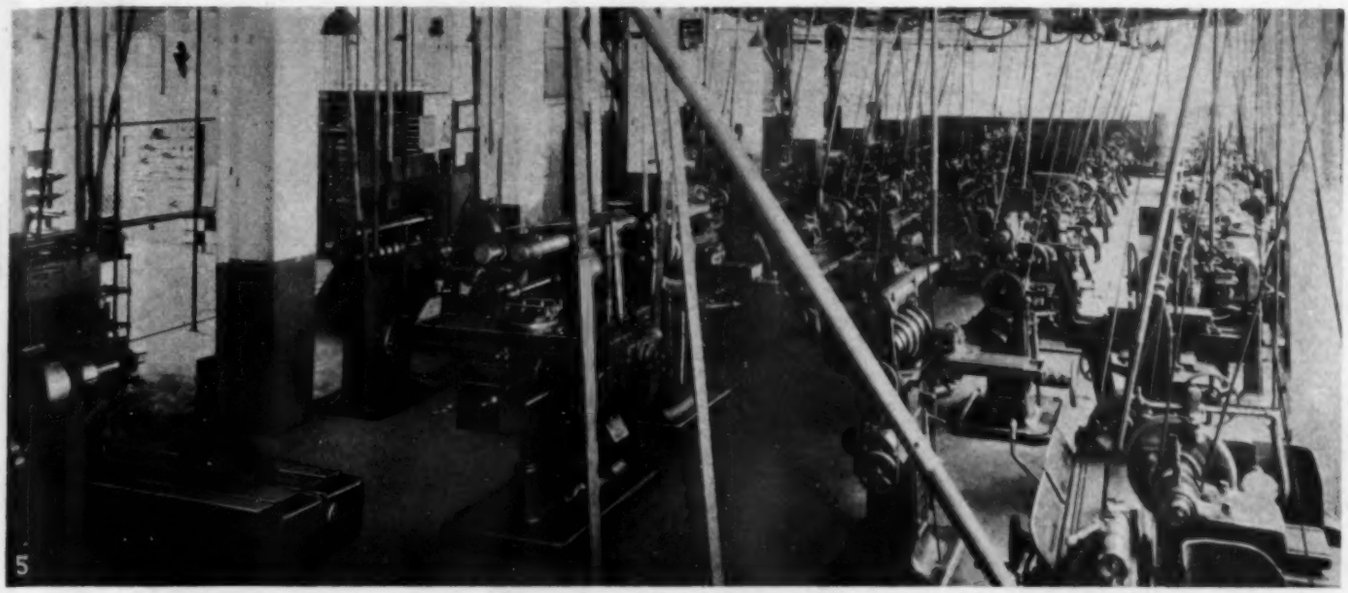
Where Boys Learn

1—General view of foundry — 32-in. Whiting cupola—other furnaces—standard aluminum flasks piled at left

2—Core department and molding machines

3—Forty forges, anvils and a Beaudry power-hammer

4—Benches, lathes and drilling machines in the heat-treating laboratory



Practical Shop Work

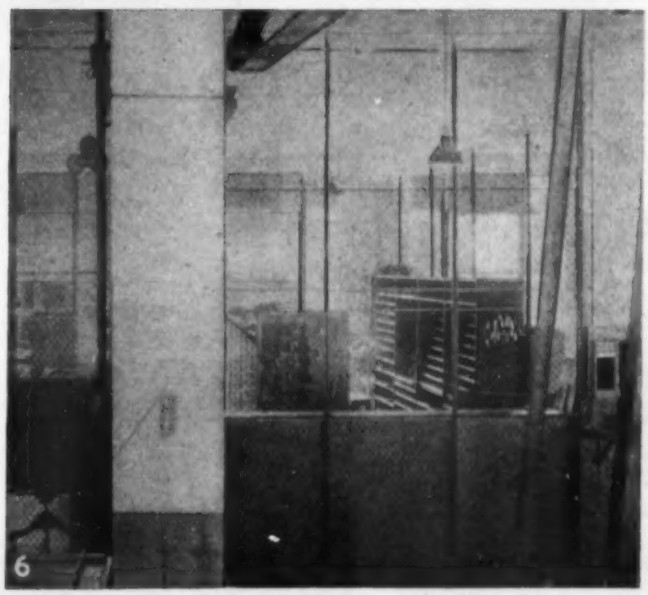
5—Machine shop—14 kinds of lathes—5 milling machines — planer, shapers, grinding machines and die casting machine

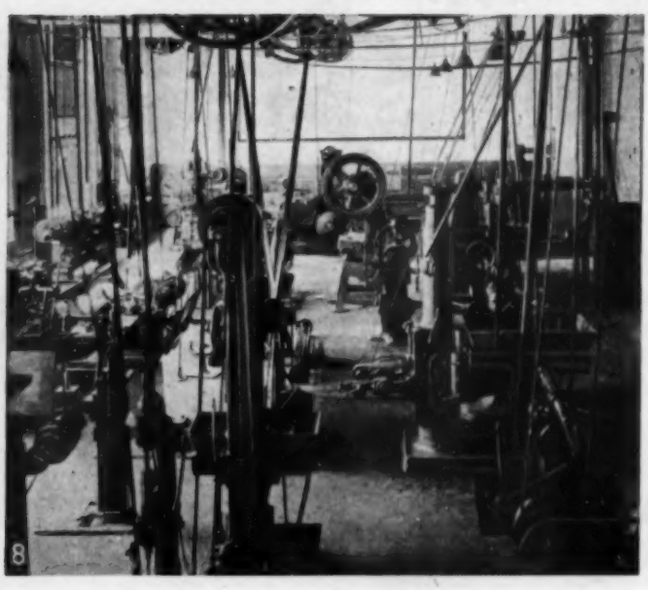
6—Looking into the tool crib

7—Heat-treating and testing laboratory, gas and electric furnace, hardness tester, and other apparatus

8—Production machinery of various types

University of Michigan
Ann Arbor, Mich.





Modern Drafting Rooms

1—Cincinnati Milling Machine Co.—Seven 100-watt lamps in each group

2—Commonwealth Steel Co.—150-watt lamps

3—Brown & Sharpe Manufacturing Co.—Individual lighting for each man

More Odd Jobs in a Grinding Shop

By Ellsworth Sheldon
New England Editor, *American Machinist*

Queer things that come to the department — Grinding rubber and celluloid — Not all experiments are successful

THE EXPERIMENTAL department of a shop engaged in the manufacture of grinding machinery serves two purposes: to develop and perfect machines and devices that are to go into the shop's regular product; and to determine the possible applicability of the abrasive wheel to other lines of manufacture in which it has not hitherto been used. Sometimes, in the latter case, the initiative comes from within; oftener from some outside manufacturer who has a hunch that his own methods might be improved upon to his advantage.

Though by far the greater volume of material handled on grinding machines is of iron and steel in some of its many forms, there are other materials brought in for experiment to which the process would

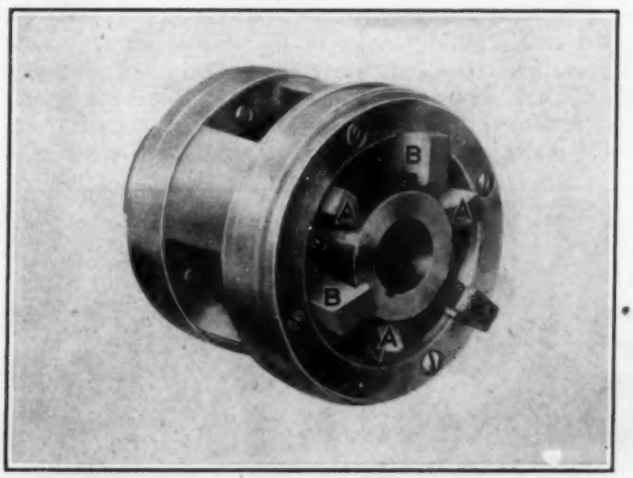


Fig. 2—A chuck to hold thin bushings

at first glance seem to be entirely unsuited. A previous article has described the grinding of such materials as carbon, asbestos fabric and bakelite; this one shows that the wheel may be called upon to shape articles of rubber, and even of celluloid.

One day a quantity of packing rings, molded flat disks composed of rubber and asbestos fibers, was sent to the department with a request for data on the possibilities of finish by grinding. The rings were 4 in. in diameter and a trifle over ½ in. thick. They were to be ground on both sides, to a finish thickness of 0.0457 in., with a limit of error of 0.002 in. The surfaces had to be smooth and without scratches or indentations that might cause leakage when the rings were put into service.

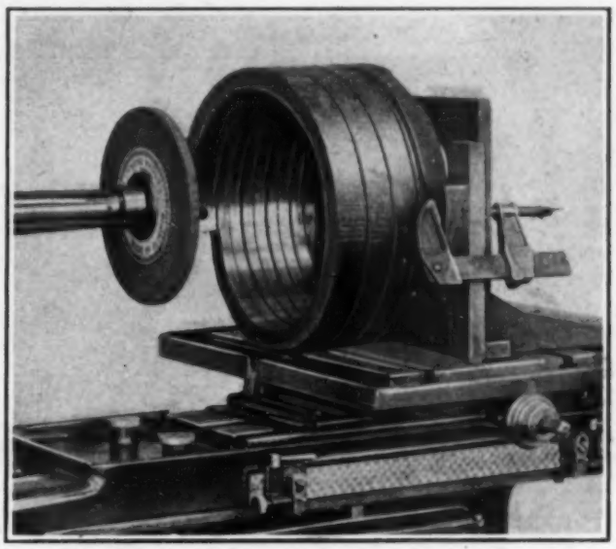


Fig. 1—Grinding a large coil spring

The job was successfully accomplished on a rotary surface-grinding machine with a 46-L alundum wheel, running at a surface speed of approximately 4,200 ft. per minute. These rings are now regularly produced in this manner by the manufacturer, using a standard machine of the above type from which the usual magnetic chuck has been removed and a special universal chuck substituted to hold the rings.

Not every experiment conducted by the department can be expected to meet with unqualified success. One manufacturer whose product included dice, conceived the idea of making them of celluloid. He said that if he could produce transparent cubes that were exactly square on all angles and of uniform dimensions he could find a ready market for them at any price the cost of production might warrant. The grinding machine could be depended upon to produce the cubes with mathematical precision, and the transparency would immediately reveal any attempt to "load" them for the purpose of causing them to fall more readily one way than another.

Surface Lacked Finish

Of course the machine came through without difficulty in the matter of accuracy, but, despite all endeavors to find a suitable wheel, the required surface could not be secured. The ground cubes presented a beautifully finished appearance, but with a cloudy effect that defeated one of the main objects of the experiment. As the probable demand was not sufficient to warrant extended experiment, the attempt was abandoned.

The experiments of the department are by no means confined to unusual materials. Many of the subjects are of hardened steel, most of them in familiar form, but with an occasional departure from the regular order. One such part was the helical spring, shown in

Photographs and data by courtesy of the Heald Machine Co. An article under the title, "Odd Jobs in a Grinding Shop," published on page 421, described other jobs performed in the same shop.

Fig. 1, made from a bar of tool steel of rectangular section, forged to shape and duly tempered.

The coil was about 14-in. outside diameter by 10 in. long, and the important dimension was the bore, which had to be 12 in. in diameter, with a plus or minus allowance of 0.001 in. The work was done on a standard cylinder-grinding machine with the work confined

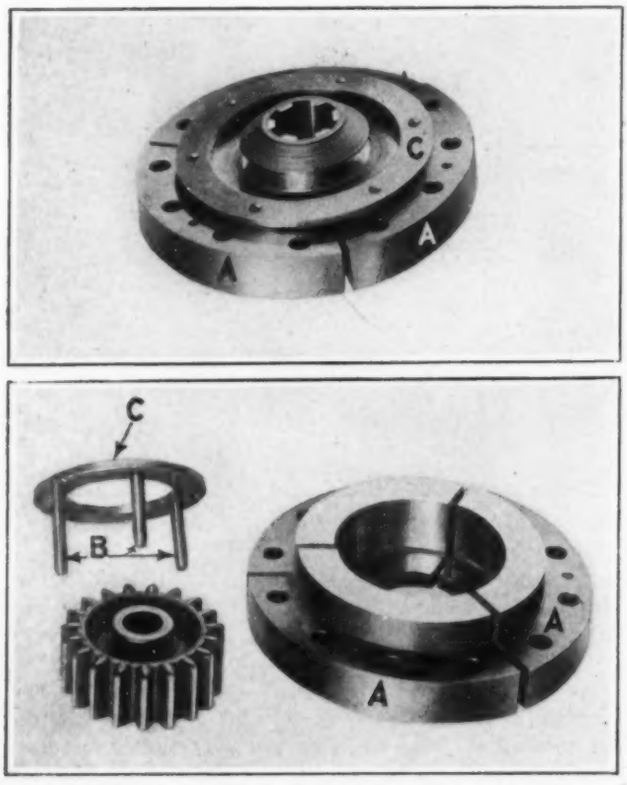


Fig. 3—Collet attachments to hold gears at pitch line

by clamps to an angle plate. The grinding time varied from two to three hours for the individual springs as there was considerable difference in the forgings, leaving from ⅛ to ¼ in. of stock to be removed.

A very common request that comes to the department is for some device to hold thin-walled bushings without distortion, so that when the bore is ground it will remain round when released from the holding device. The difficulty increases, of course, as the thickness of wall decreases, and about the only way to hold very thin shells satisfactorily is to wring them into a previously ground bushing.

The chuck shown in Fig. 2 is very well adapted to hold bushings with moderately thin walls. The piece to be seen in the chuck in this illustration is not a sample of the work it is to hold, but is a bushing of the same size and length, used to assist in making the chuck.

This chuck has two sets of jaws that are quite independent of each other, each set being hinged to a separate spider and the spiders actuated together by the draw-tube of the machine. The inner spider, to which are attached the three centering jaws *A*, is not fastened to the draw-tube, but is fitted to slide freely upon it. A rather light coil spring, surrounding the tube between the spider and a collar that is fixed to the tube, is the medium through which the movement is transmitted.

When the draw-tube is moved back to operate the chuck the three centering jaws move inward in the same manner as the jaws of a spring collet, until they contact with the outside of the bushing, but instead of applying a crushing pressure the further movement of the draw-tube results only in compressing the coil spring.

At the same time the holding jaws *B*, hinged to the spider that is rigidly attached to the draw-tube, move inward, closing upon the work-piece as their enlarged ends pass under the rounded corner of the bore of the chuck shell, but not quite touching it. The hooked ends of the jaws are adjusted to catch over the end of the bushing to be held and clamp it by end pressure against a shoulder in the bottom of the chuck.

This device holds bushings having not too thin walls with very satisfactory results. Its principal disadvantage is its limited range, as there must be two sets of jaws for practically every deviation in diameter or length of the piece to be held. As the grinding of such bushings is almost invariably a manufacturing proposition, where the number of pieces to be ground is practically unlimited, this disadvantage is of little moment.

Gears — especially automobile gears — figure very largely in the problems of this department. Not the grinding of them, to-be-sure, for that is more or less a cut-and-dried proposition nowadays, but every little gear, and, more particularly, even every gear manufacturer, presents peculiarities that must be considered individually. The devices shown in Fig. 3 are to be attached to the jaws of a draw-in collet to locate gears from the pitch line while grinding the bores.

The two examples shown are identical in principle, but to hold different gears. One is shown with the gear and pins in place and the other with the parts separated. The jaws *A* are of cast iron and are made to be attached by screws and dowels to a common spring collet, which thus may serve as the basis of a fixture to hold many sizes. The diameter of the hardened steel

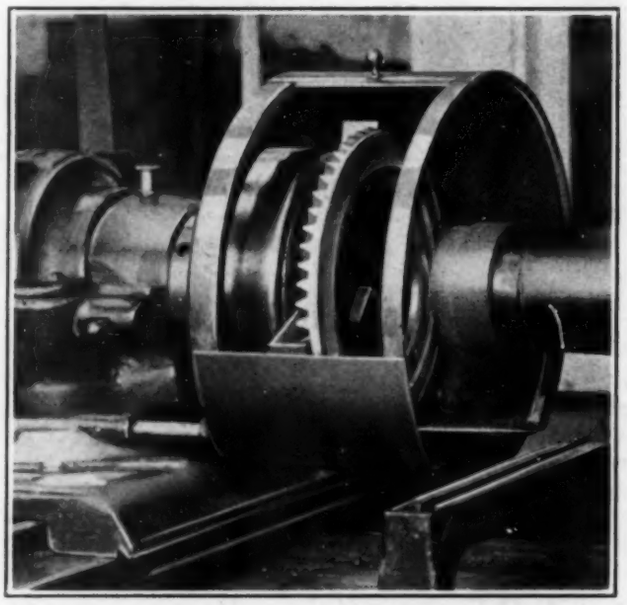


Fig. 4—Bore grinding and facing at one setting

studs *B* is so calculated that when they are placed in the gear tooth spaces the line of contact with adjacent teeth will be at the pitch circle.

The ring *C* is merely a convenient means of keeping the studs together to prevent them from becoming lost.

The studs are shouldered loosely into the holes in the ring and headed over just enough to prevent them from dropping out but not to confine them rigidly. Thus, when in place in the gear and under pressure from the holding collet, the studs align themselves with the gear teeth and the ring must be loose enough to shake with the fingers when the gear is clamped tightly in the collet.

The only thing at all unusual about the gear grinding job shown in Fig. 4 is that two wheels are used at once on the same spindle for the purpose of grinding the bore and facing the back of the web square with it while still in the grip of the fixture. This is of a very common type, fitted with jaws to locate the work from the pitch circle. The material from which the gear is made is pack-hardened steel.

The amount of material to be removed from the bore is from 0.018 to 0.020 in. on the diameter and ranges anywhere from zero to 0.030 in. on the web, as may be required to clean up. The bore-grinding wheel is

Fig. 5—An antiquated method of face grinding

a 6638-K alundum. It requires redressing after grinding about 30 or 35 pieces, and is discarded after grinding 350 pieces. The smaller wheel, a 46-M alundum, has a recessed center and grinds only upon the face. It is necessary to redress it after every five or seven pieces in order to have it cut freely and leave a satisfactory surface, and it grinds about 250 pieces before it must be discarded.

The work speed on this job is 240, and the wheel speed about 4,700 r.p.m., with a comparatively rapid rate of traverse. To pass the facing wheel over the web, which is $\frac{1}{4}$ in. wide, the special cross-sliding head is traversed by hand.

Practically all of the jobs that come to this department for experiment have previously been handled in some other way, and the experimentation is to determine whether or not the cost of production may be reduced or the quality of the product be bettered by substituting the grinding wheel for whatever methods have been employed. One such job is mentioned here, not because of there being anything out of the ordinary in grinding it upon a rotary surface grinding machine, but because of the oddity of the superseded method.

The job is the grinding of what is known in the vernacular of the shoe and leather trade as "clicker" dies. They are not, strictly speaking, dies at all, but sharp-edged closed forms that are used to cut various shapes from a side of leather, the cutting being done against a block of wood. It is important that, before one side of the form is reduced to the keen knife-edge necessary to cut the leather, the form be made parallel in thickness; else there would be places in the contour that would not cut clear through.

To place any number of these rough-forged shapes on the magnetic chuck of a rotary surface-grinding machine and reduce them to uniformity and parallelism at once with a grinding wheel is so simple that *not* to do it that way is absurd; yet it is but a very short time since the method shown in Fig. 5 was regularly employed.

The grinding medium was a plain sandstone wheel, 7 ft. in diameter by 8 in. thick when new. One side of the stone would be dressed smooth and flat, and the workman would hold the pieces one at a time in his fingers, pressing them against the side of the revolving stone with almost any old kind of an improvised lever. The man shown in Fig. 5 is using a stick of what the carpenters call "two-by-four" spruce. A jet of water impinges against the side of the stone near the collar and spreads itself in a thin film over the face by reason of centrifugal force, incidentally flying from the corner of the stone in all directions as a corona of fine spray, and requiring extensive guards.

It required expert workmanship and frequent gaging, with corresponding shifts in the positions of the work and lever, to maintain anything like parallelism of individual pieces, and uniformity between pieces was hardly to be thought of. There is no comparison whatever, in speed of production, accuracy of result, or comfort to the workman, between the old way and the new.

Piston and Piston-Ring Oversizes

Owing to the changes in the practice of refinishing cylinders, piston and piston-ring manufacturers have found it increasingly difficult to meet the large orders for non-standard oversize pistons and piston rings for use on reground, worn cylinders. The Simplified Practice Division of the Department of Commerce called a conference in December, 1924, to revise the inadequate standards adopted in 1912 by the Society of Automotive Engineers.

A subdivision of the Engineering Division was appointed and it reviewed the practices of thirty passenger-car builders, six tractor, seven motorboat and fifteen truck and industrial-engine builders.

The standard oversize pistons for passenger-car, marine and airplane engines, as recommended by the committee, are 0.003, 0.005, 0.010, 0.015 and 0.030 in. The standard oversizes for tractor, truck and industrial internal-combustion engines are 0.010, 0.020, 0.030 and 0.040 in. Larger sizes, when necessary, are to be held to multiples of 0.010 inch.

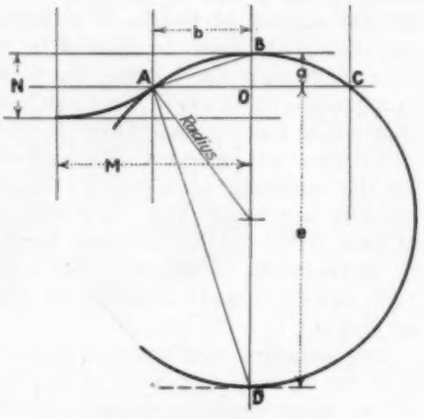
Piston rings are to be held to the same sizes, omitting that of 0.003 inch.

The recommendation will be acted upon by the Engineering Division at its next meeting.

A Reverse Curve Formula—Discussion

By Geo. D. Taylor

In an article under the title given above, on page 570, Vol. 62, of the *American Machinist*, Hubert G. Smith said he was unable to find a ready-made formula by which to solve his problem for finding the radius of two equal reverse curves. Formulas for finding the radii of curves were published on pages 892, 913 and 1027, Vol. 23, of the *American Machinist*. The derivation of a very simple formula is shown below.



Layout of reverse curves

In the illustration, b equals ½ the chord AC, a equals the rise of the arc, and e equals the diameter minus a.

From the similar triangles DAB and AOB, the following ratio between the sides is evident,

$$e : b = b : a$$

$$e = \frac{b^2}{a}$$

then the diameter or $e + a = \frac{b^2}{a} + a = 2R$

$$\text{or} \quad R = \frac{a^2 + b^2}{2a}$$

This equation in words would be:

$$R = \frac{(\frac{1}{2}\text{ chord})^2 + \text{height}^2}{2\text{ height}}$$

Where R = the radius to be found.

Using my rule, the distance $\frac{M}{2}$ in Mr. Smith's diagram is approximately $1\frac{7}{64}$ in. or 1.109 in., and $\frac{N}{2}$ is 0.375 inches.

Substituting in the formula:

$$R = \frac{(1.109)^2 + (0.375)^2}{2 \times 0.375} = 1.827$$

In the case of equal reverse curves, such as the diagram shows, R will be the radius of both curves.

Drafting Tolerances

By John F. Hardecker

"Well, Bill," said John Brown to his fellow chief draftsman over their ice cream at one of their weekly lunches, "I certainly had my eyes opened to an unconscious waste of money on our part by our shop superintendent this morning.

"He evidently had been making a study of our failing for some time, because he certainly had the evidence on us with a dozen detail part prints, on which he had the costs of rejection due to close tolerances, and on which he showed me that the close tolerances we specified weren't really necessary for the successful functioning of the parts.

"It may be all right to say that tolerances are really the responsibility of the draftsman and checker on these parts, but I wonder if there isn't a surer way out."

"Yes," said Bill, "I believe there is. We've run into the same difficulty ourselves, and I believe we've eliminated it to a great extent. We made a thorough study of tolerances in general, and evolved what we call general tolerances. These are reasonable tolerances, applicable to 95 per cent of our work, that we arrived at by consultation with our various shop foremen for their particular classes of work.

"So we've listed these on a tolerance sheet, which we furnish our men, with the instruction that they are to place these on their drawing as a note, 'Tolerance—except as noted.' So it happens, that only where the draftsman knows he particularly needs a closer tolerance does he actually specify his own tolerance, all other dimensions taking the general tolerance.

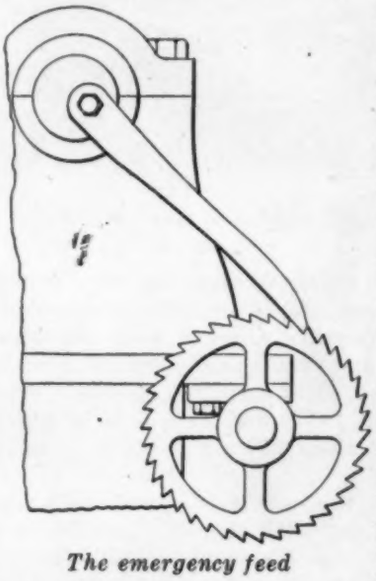
"And as these general tolerances represent the thought of the heads of the engineering and shop departments rather than that of the individual detailer, they are better by just that much, and have so worked out."

Ingenuity

By John H. Earl

Many men have served their apprenticeships and become good machinists. They can step up to a lathe and with the proper tools and a blue print to guide them, can turn out excellent work with a rapidity and skill that cannot be questioned. However, all machinists do not have the ingenuity and originality that goes to make an outstanding mechanic.

A case that came to my attention recently will serve to illustrate this point. A young machinist, in an isolated plant, started in to overhaul a quick-change lathe. There was but the one lathe in the shop, and the job had been put off until the machine was so noisy that it could be heard all over the shop. The overhauling involved much turning. Some of the gears had to be rebored and a new shaft and some new bushings made.

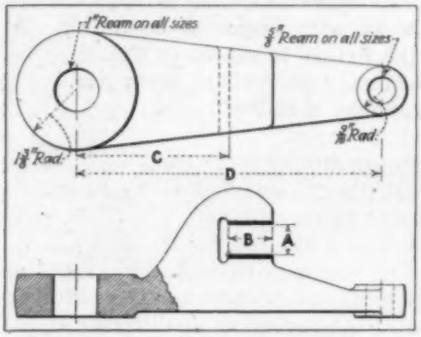


The emergency feed

After the gears had all been removed, the lathe could, of course, be operated in the usual manner, excepting for the feed. The machinist started in to do the feeding by hand, but as the work required close finishing, it was hard to do a good job in this manner, and he cast about for means of feeding the lathe mechanically.

He finally drilled a hole in the end of the spindle, eccentric with the center, and tapped it for a ½-in. cap-screw. He then had the blacksmith make a pawl, which was applied as shown in the sketch. The half nut was locked on the screw as in threading, which made the feed just right for good work.

Conditions of the Problem



Design a fixture to hold the work while the metal indicated by the heavy lines at the dimensions A and B is being removed. Seven sizes as tabulated are to be considered. The fixture may be universal to accommodate all sizes or individual fixtures may be designed to take one or more sizes as may seem desirable. Economy in cost and highest operating efficiency are desired.

Material—Cast iron.

Depth of cut—approximately ⅛ in.

Total quantity — 200,000 yearly (in lots of 5,000 each).

Both ends have been straddle milled and reamed.

Contestants to select method, type of machine tool, small tools and to design fixture. Feeds, speeds cutting time and floor-to-floor time must be given.

A	B	C	D
½	½	3	6
½	½	3¼	6
½	½	3⅜	7½
½	1	3½	7½
½	1	4	7½
½	1	4¼	8
½	1	4½	9

Summary of the Solutions to the Second Prize Problem

How the winning solutions were selected

THE second prize problem, shown on page 632, Vol. 62 of the *American Machinist*, offered a greater opportunity for the tool designer to show his skill on fixture work than the first problem, published in March, and, judging from the answers submitted, was considered more interesting to the readers who participated. Answers were received from all parts of this country as well as various points of Europe. The designs of fixtures as a whole show the trend toward modern fool-proof tooling, incorporating simplified loading and unloading, and substantial clamping devices.

In general there were five methods submitted of which four recommended milling and one broaching. The milling methods included: gang; rotary or continuous; index; and reciprocating milling. The winning solutions incorporated milling, although the broaching method was considered practical by the judges.

In a number of instances it was necessary to disqualify solutions because of lack of strength in the fixture design. This point was obvious in a number of the rotary fixtures where the base consisted of a cast-iron slab over 32 in. in diameter and only 1 to 1¼ in. in thickness. If made too thin it would warp or spring out of shape, therefore a ribbed form of base should be used. This point was overlooked in so many cases that special emphasis is given here in hope that the contestants submitting such designs can profit by avoiding similar errors on actual work.

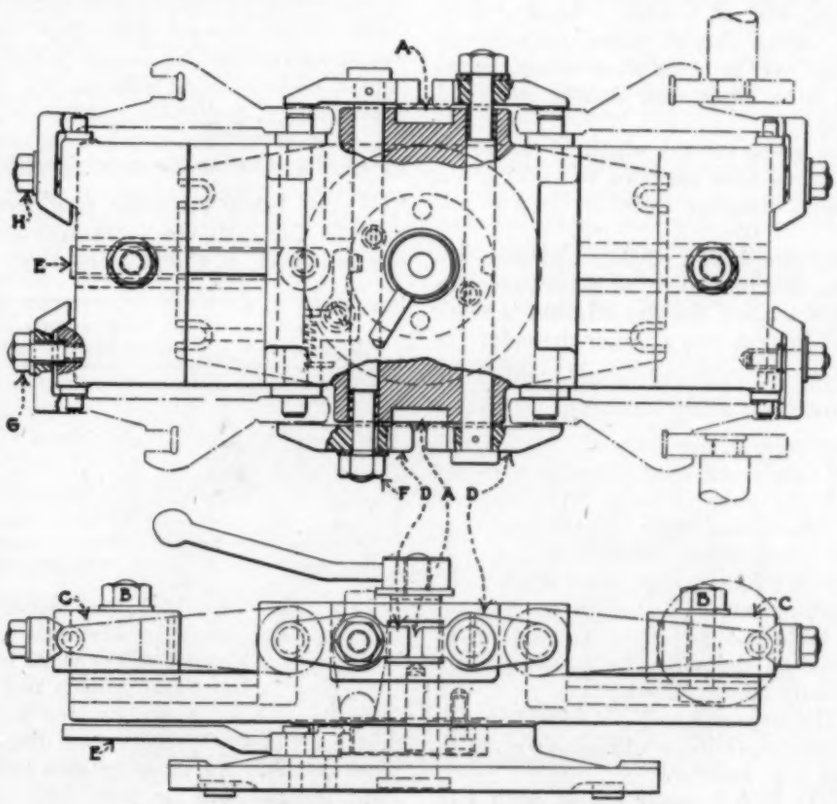


Fig. 1—Indexing fixture for milling work in pairs

Another feature was the method of accommodating

the various sizes of work to be machined. Sliding studs were almost universally used, being positioned and locked in a variety of methods. In some cases the designs called for removable studs that were to be screwed into holes positioned to suit the work. Too many tapped holes were required within a small space to make this style of location practical. One solution called for a rather intricate form of sliding block operated by a set of bevel gears. A movement of this kind is entirely too expensive.

One of the Winning Solutions

The prize-winning solutions were offered by B. R. Sheets, Denver Rock Drill Co., Denver, Colo., and Robert S. Church, Fellows Gear Shaper Co., Springfield, Vt. Mr. Sheets' solution read as follows, the design of the fixture being shown in Fig. 1:

Type of machine tool: Cincinnati 48-in. automatic duplex milling machine.

Cutters: ⅜x5-in. special-hole (for stub arbor, flush head-screw) high-speed coarse-tooth side-milling cutters.

Speed: 50 ft. per min., 40 r.p.m.

Feed: 3 in. per min., 0.080 in. per rev.

Cutting time: 25 sec. per cycle., 12½ sec. per piece.

Floor to floor time: 1 min. per pair, 30 sec. per piece.

Description of fixture: Indexing fixture, adjustable to seven different pieces of work.

To adjust fixture for different sizes, loosen nut *B* and slide block *C* to fit center distance, using two pieces of work as a gage. Two hardened blocks *A* are held in place with suitable fillister-head screws and shouldered on the bottom to form a stop for the work clamps *D*. The work-clamp shaft is keyed to both clamps so that both clamps free the work in unison and can be operated with one hand from either end of the fixture.

The operations required for unloading and loading, exclusive of indexing, are as follows: Loosen three nuts, *F*, *G*, and *H*, swing clamps down, remove two pieces, place two pieces over locating pins, swing clamps up and tighten the three nuts (use double open end wrench ⅞x¾-in., U.S.S.).

As no dimension is given for the width of the relief at the back of cut, it has been assumed to be ¼x⅛ in., in order to allow a 5-in. diameter cutter to clear on the extreme edges.

The judges consider the design efficient although the size of the supporting base on which the fixture revolves could have been made larger, thereby offering a more substantial and rigid support and a larger diameter for the locating plunger.

The Other Winning Solution

Method: Continuous milling.

Machine tool: No. 2 Cincinnati vertical miller equipped with a standard 18-in. circular table. The table is driven through a telescoping shaft and two universal joints, from an auxiliary shaft, which is driven from the feed gear-box. A single-thread worm on the telescoping shaft, meshing with a 120-tooth gear on the table, rotates the table and furnishes the feed. Feed changes are secured by changing the position of the feed levers, as usually accomplished.

Type of cutter: High-speed steel, interlocking side mill, 6 in. in diameter, ⅜-in. width of face, 1¼-in. diameter hole, and ¼-in. keyway.

Cutter arbor: No. 11 B. & S. taper shank, with ¼-in. keyseat and special short-head clamping screw.

Wrench: Socket wrench to fit standard ⅝-in. nut.

Type of fixture: Universal, to hold all the sizes of the work under consideration. After cutter is once set for a given size, the operator's time is spent in replacing finished work with pieces to be milled. A detailed view of the fixture is shown in Fig. 2.

Speed of milling machine drive pulley: 200 r.p.m.

Speeds of cutter available: 8 to 200 r.p.m.

Speed of cutter used: 37 r.p.m.

Cutting speed: 58 ft. per min.

Speeds of circular table available: 0.05 to 2.1 r.p.m.

Table speed used: 0.092 r.p.m.

(The same table speed will be used for all sizes.)

The feed in inches per minute will vary slightly, because the dimensions *C* and *D* vary, for the different sizes, and the cutter will be working at different radii.

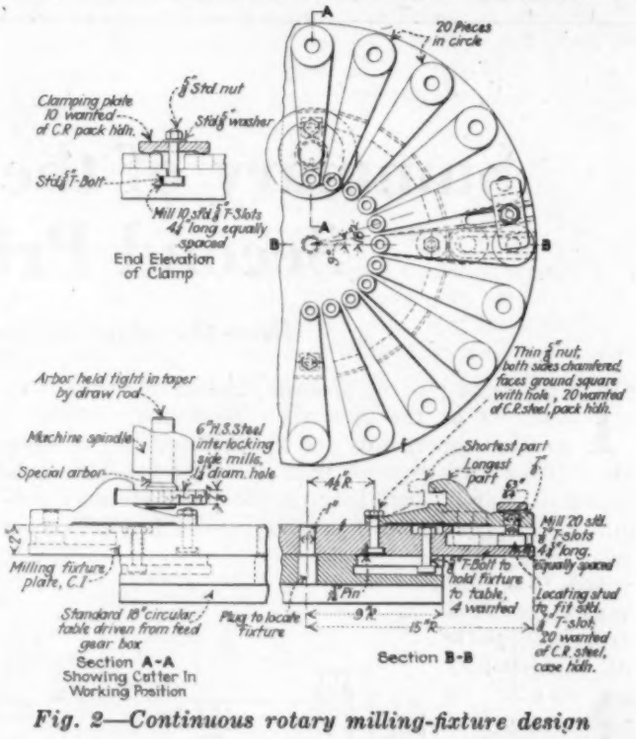

20 Pieces in circle
⅝" Std. nut
Clamping plate 10 wanted of C.R. pack hdn.
Std. ⅝" washer
Std. ⅝" T-Bolt
Mill 10 std. ⅝" T-Slots 4" long equally spaced
End Elevation of Clamp
Thin ⅝" nut; both sides chamfered, faces ground square with hole, 20 wanted of C.R. steel, pack hdn.
Arbor held tight in taper by draw rod
Machine spindle
6" H.S. Steel interlocking side mills, 1¼" diam. hole
Special arbor
Shortest part
Longest part
Mill 20 std. ⅝" T-slots 4" long, equally spaced
Milling fixture plate, C.I.
⅝" T-Bolt to hold fixture to table, 4 wanted
Locating stud to fit std. ⅝" T-slot, 20 wanted of C.R. steel, case hdn.
Standard 18" circular table driven from feed gear box
Plug to locate fixture
Section A-A Showing Cutter In Working Position
Section B-B

Fig. 2—Continuous rotary milling-fixture design

The table below gives the feed, cutting time and production, for each size, corresponding to the tabulated dimensions *A*, *B*, *C* and *D*, as given in the problem:

Dimensions				Feed In. per Min.	Cutting Time in Minutes	Production Pcs. per Hr.
A	B	C	D			
⅞	¾	3	6	4.3	.5	120
⅞	¾	3¼	6	4.2	.48	125
⅞	¾	3 1/16	7½	4.8	.55	110
⅞	1	3¼	7½	4.8	.55	110
⅞	1	4	7½	4.6	.53	113
⅞	1	4¼	8	4.8	55	110
⅞	1	4½	9	5.2	.6	100

The floor to floor time will equal the cutting time in each case.

The judges consider that hardened locating blocks for the work would be advisable in this design.

The general layout of the work is considered good as little time is lost between each two pieces.

While a great many designs showed excellent tool-designing methods, they were disqualified due to some weak points. At an early date some of the more efficient designs will be published. The *American Machinist* again thanks all those who participated.

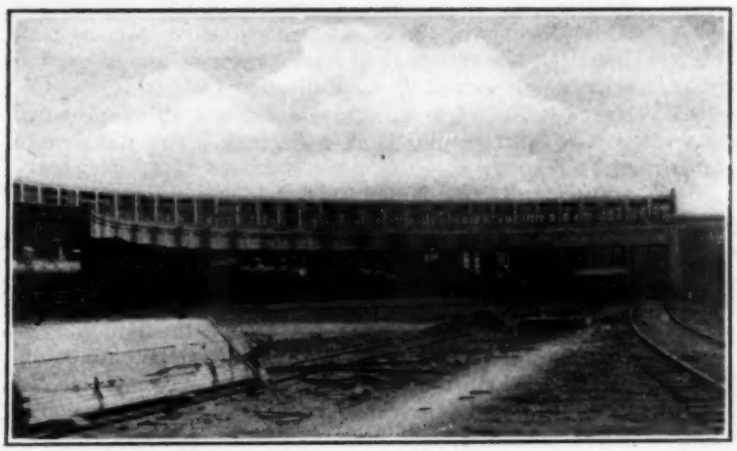


Fig. 1—The roundhouse and turntable

An Efficient Roundhouse in Georgia

By Fred H. Colvin
Editor, *American Machinist*

An unusual design, of reinforced concrete construction, in which each pit is served by a 10-ton traveling crane—Details of equipment and performance in repairs

THE combined roundhouse and shop of the Central of Georgia Railway at Columbus, Ga., is unique in several ways. The design of the structure, the layout of the roundhouse and shop, and the use of a 10-ton traveling crane, which travels on curved rails, over every locomotive in the roundhouse, are all worthy of note. The building is of concrete and has plenty of window area on the shop side. It is high enough for the crane to lift any locomotive part and clear the other locomotives as it is carried to the machine shop. It is large enough so that locomotives, including mallet, or 2-6-6-2 types, can be run in, have the doors close behind them, and still leave room for a man to walk past their pilots. Fig. 4 shows the general arrangement and pincipal dimensions.

The system of handling locomotives is based on the theory that an ounce of prevention beats all the cures that can be devised. Engineers' reports are examined, of course, but the greatest reliance is based on the work of the inspectors whose duty it is to go over locomotives as they come in from a run. One man, for example, looks after pedestal-binder bolts and shoes and wedges, to detect wear before it becomes great enough to make trouble.

At regular and frequent periods, every truck and tender brass is taken out for close inspection. Unless each one is O.K. in every way, a new one is put in its place. Driving boxes are watched carefully and should one heat, the wheels are dropped at the end of the run, a very light cut taken from the journal, and a new crown brass fitted. This is believed to be much better in every way than to try to coax a box that has once run hot, back into good behavior. The shop prefers to take no chances of trouble the second time. As a result the number of delays from engine failure have been almost unbelievably small.

At specified times the front cylinder heads are removed and the wear of the piston head noted. For superheated locomotives this wear is not allowed to exceed $\frac{1}{8}$ in. When that limit has been reached, the piston rods and heads are removed and the piston heads built up with phosphor bronze, by arc welding. They are then turned to the proper size and replaced, the bronze being a good wearing metal for the cylinders.

By watching piston wear in this way, piston ring breakage is materially reduced, as also is excessive wear on piston rods and piston-rod packing. Connecting- and side-rod bearings are also watched very closely and new bushings applied, or strap-end rods taken up, as the case may be. The result is the locomotives stay on the job where they are earning dividends.

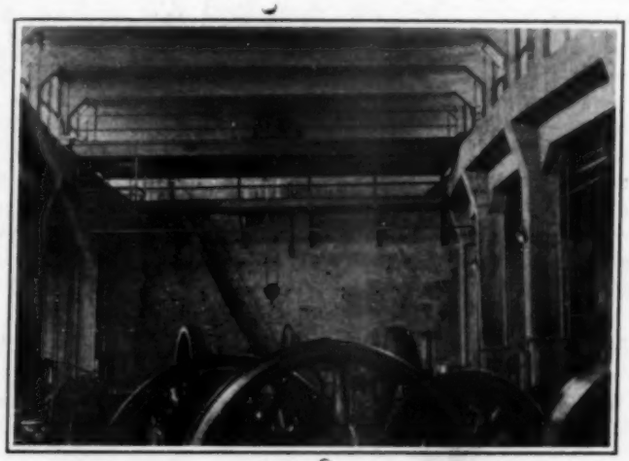


Fig. 2—Concrete piers and curved crane-runway

One noticeable feature of the shop is the large number of young men. Most of them have been trained here in the shop. A number are from the Georgia Institution of Technology, where they worked on the co-operative or part-time plan. The boys in this institution work each alternate month and attend school the next month. While in the shop the boys are taught everything in connection with

locomotive work. The more experienced boys are given charge of work, and so cultivate executive ability in addition to learning the trade itself. These boys are proving very adept and set valves, line up locomotives, take up shoes and wedges, and do many other jobs which used to be considered secrets of the trade.

The boys have inaugurated a question-box system by which any question can be asked and answered. At times they are answered by taking the boy right to the locomotive or machine and showing him just what he wants to know. W. A. McCafferty, the master mechanic, has also established a daily foremen's meeting, which almost automatically keeps the shop clear of any delays in work and of congestion in different departments, and also effectually prevents friction. Its

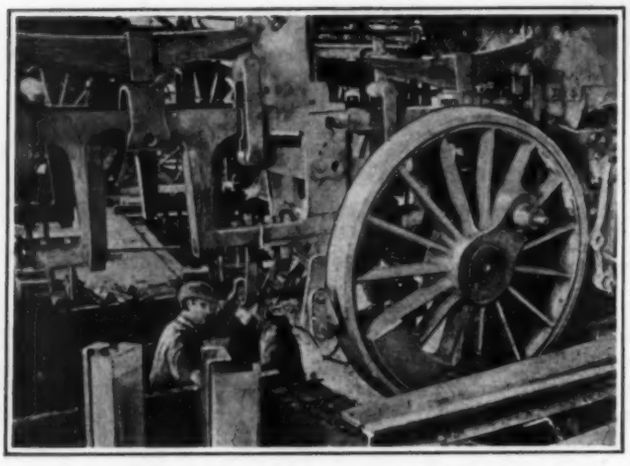


Fig. 3—At the drop pit

principal object is to promote co-operation and it is evidently succeeding.

Returning to the construction of the roundhouse itself, the illustrations will serve to show just how it is laid out and some of the details of its construction. The general appearance of the structure is seen in Fig. 1, taken from the yard, not from the turntable, that can be seen on the right. It is a good looking building, the street side being particularly attractive and having a large percentage of glass area for ample light.

The plan view, Fig. 4, shows such details as the drop pits, the long pits and the layout of each machine in the shop. The machines are grouped and each group driven by its own motor. Fig. 2 shows the construction of the building, the curved runway for the crane and the wall that separates the shop from the boiler room, washing and filling tanks, air compressors, etc. Fig. 3 is a close-up of a locomotive over the drop pit.

The enginehouse is of reinforced concrete throughout, with wood block floor. In shape, it is a combination of the two general types—radial and rectangular. The roof has a raised section or monitor, forming a center bay running the entire length of the enginehouse and shop section of the building. A 10-ton electric, overhead crane operation in this bay serves both the enginehouse and machine shop. Fifteen radial stalls, 120 ft. long, are provided and provision is made to extend the building to include nine additional stalls when necessary. Each stall is provided with a concrete pit, 95 ft. 3 in. long. The stall tracks are served by a 100-ft. deck, balanced type, steel turntable operated by a 30-hp. electric-motor tractor. The distance from the center of the turntable to the inner wall of the enginehouse is great enough to give 13 ft. clear door opening without having the tracks cross before reaching the turntable, thus avoiding the use of frogs. The triangular portion of the building, in conjunction with a section near the western end, equivalent to four stalls of the enginehouse, comprises the shop section. Boiler room, air-compressor room, engineers' and firemen's wash rooms, roundhouse foremen and engine-dispatchers' office and master-mechanic's office are located at the extreme western end of the building, the latter office being on the second floor. A casting platform and steel storage rack are conveniently located in front of machine shop in the space included between the turntable and inner wall of the building. Artificial and natural lighting, heating and ventilation are amply provided. A well-equipped tool room is located convenient to the enginehouse and shop forces.

The driving-wheel drop pit with air-lift jack extends across three engine pits near the machine shop. A wheel track between the pit tracks and machine shop is provided for wheels while boxes are being removed or fitted. A tender-wheel drop pit is located on the first track outside of the north wall of the building.

In the machine shop, wheel lathes are convenient to the wheel track and drop pits, and these and other heavy machines are so located that they may be conveniently served by the overhead crane in the center bay. The usual complement of other machines, such as engine and turret lathes, boring mills, shapers, planers,

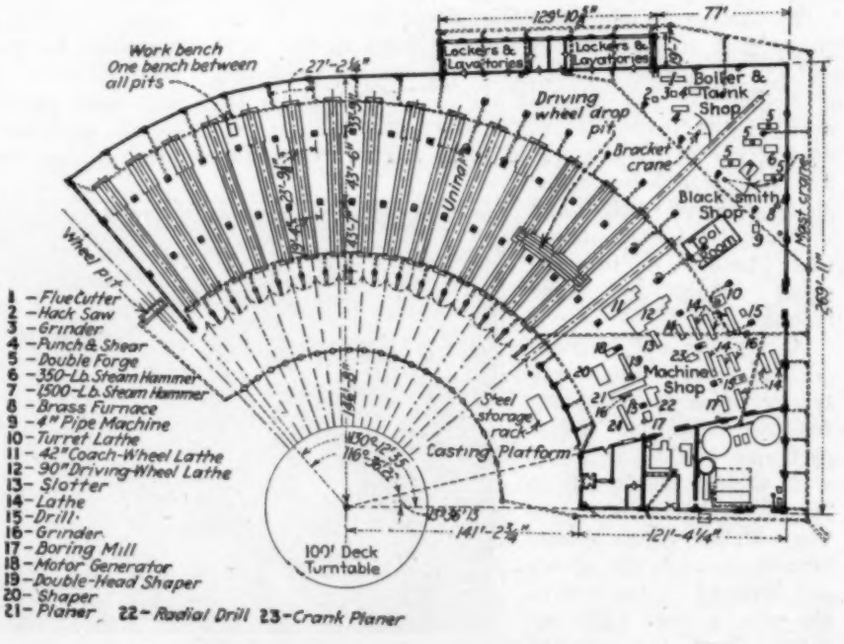


Fig. 4—Plan of roundhouse and shop

slotters, grinders, and drill presses, are provided and conveniently located to take care of classified and running repairs.

The blacksmith shop is well equipped and space is provided for increased capacity. The principal equipment consists of one 1,500- and one 350-lb. steam hammer served by four double forges. A 2-ton mast crane placed near the heavy-fire forge serves the 1,500-lb. hammer. Equipment for thermit welding of locomotive frames is also provided. The pipe and tin shops are combined. A complete complement of tools is provided, such as pipe benders and threading machines, burring machines, rollers, folding machine, grooving machine, swaging, crimping and wiring machines.

The brass and white metal shop is under the same

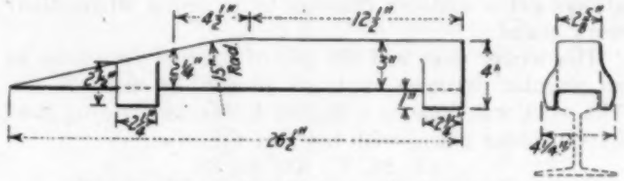


Fig. 5—The "lizard" for replacing springs

supervision as the pipe and tin shop. In this department, brasses and crossheads are relined and brass hub faces are cast on driving and truck boxes. A 360-lb. capacity tilting, crucible furnace is used for melting brass.

The auxiliary-devices department is located in the extreme corner of the triangular section of the building and is under the supervision of the machine shop foreman. The usual repairs to air-brake equipment, injectors, lubricators, headlights, "pop" valves and gages are handled in this department.

Co-ordinated with these modern facilities is a well-organized repair force. The compactness of the facilities permits efficient supervision with a rather small supervisory organization. The assignment of repair forces has been carefully planned. Running repairs to the various classes of power—mallet engines, mountain type passenger engines, mikado freight engines and switch engines are handled by mechanics assigned to each particular class.

A specially assigned gang handles all spring work. Specialists are assigned to such running repair work as air-brake maintenance, injector and lubricator repairs, reverse lever and throttle work, cab cock and water glass maintenance, valve stem and piston rod packing, power reverse maintenance, and lining down shoes and wedges. Two engine carpenters and their helpers are assigned to repairs to cabs, pilots, tender trucks and frames. A mechanic is assigned especially to lubrication, assisting in supervision of running repairs.

The effectiveness of the compact layout and efficiency of the organization was demonstrated by classified machinery repairs to a Pacific type engine. All wheels were dropped, tires changed and turned, trailer tires changed, both main crown brasses renewed, side rod bushings renewed, shoes and wedges laid off and planed, guides lined, crossheads remetalled and machined, and cylinder packing renewed in 22 hours.

A very effective method of flue application is followed in the boiler shop. Flues are placed in the back flue sheet the correct distance for beading. They are then cut to correct length at front end with the acetylene torch. There is no danger of damaging the flue sheet as the flues are loose in the sheet when they are cut. Considerable time is saved over the old method of machine cutting, since the flues are handled but once. This method gives effective results, and flues have been run the full limit of four years without developing leaks in the front end. Defective staybolts are burned out with the acetylene torch, without damage to firebox sheets.

In renewing springs, jacks are not used. The work is effectively handled by the use of "lizards," as illustrated in Fig. 5. Renewing a broken driving spring and applying a new spring has been accomplished in 7 min. by this method. The lizard is laid on the rail and the driving wheel run up on it. This lifts the frame and relieves the weight on the spring of the next driver.

The annual output of classified repairs of this shop is about as follows:

Class	3 — 4	Locomotives	
"	4 — 6	"	"
"	5 — 42	"	"
"	6 — 82	"	"

This showing is good for a shop of this size.

Part of a Day's Work

BY W. EDWARD

A contract had been closed for a number of water wheels of the reaction type which involved casting, machining and handling pieces of much larger proportions than the company had ever tackled before. Particularly was this true of the runner which weighed approximately 84 tons, stood about 12 ft. in height and measured the same in diameter. This casting was successfully poured in a specially-built mold. It was transported from the foundry to the machine shop and placed on a 30-ft. boring mill which had been designed and built especially for the work. The two cranes in the machine shop were of 30-ton capacity, and were both used with an equalizing beam to pick up the casting and to set it on the table of the boring mill. Approximately 72 hours later the cut had been taken to finish the sides and one end and the casting was ready to be turned over to finish the other end. Suddenly it occurred to every one that the job of turning over was something which had not been counted on.

Two cranes could pick it up but no one would dare to try running the two in step to the nicety that is required to turn a casting over, to tip it with the slings on the bottom, to catch it just as it started to overbalance and to then let it down. One crane alone was hard enough to handle for that class of work.

"Dig a hole," said the boss, "there in a clear space. Fill it with sand. Use one of the cranes to tip the casting into the hole. Put on the slings so the least of the weight will come on the crane, letting the floor hold the most, and hitch them so they will let the wheel fall from its balance without jerking the hoist. The sand will cushion the fall."

"After it is in," he continued, "dig away the sand so it will settle the right way up to put it back on the table."

The hole was dug, and filled. The hitches were made and the casting tipped in as directed. The sand was then dug out until the casting was righted sufficiently. The emergency had been met. It was just a part of the regular day's work for the boss.

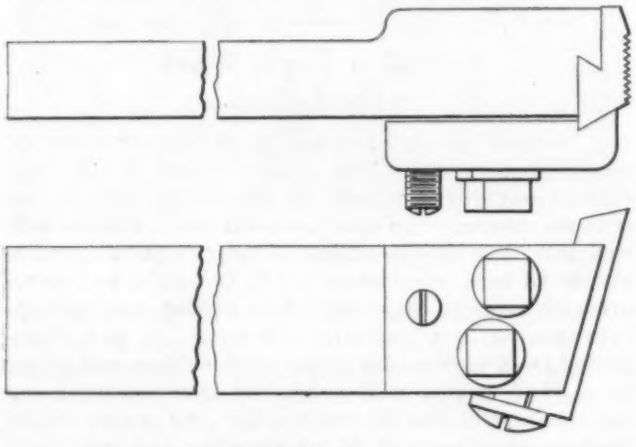
Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Salvaging Landis Thread Chasers

BY FRED S. HARGER

In the shop where I am employed as a toolmaker-machinist, we have a Landis bolt-threading machine that is used on bolts, rods and pipe for coal mines. The chasers are made of high-speed steel, and while we exercise care in sharpening them, some of them have



Toolholder for utilizing worn chasers

been used so long and sharpened so many times, they are too short to be held securely in the diehead.

Seeing a number of chasers lying around that had been discarded for this reason, I devised the tool holder illustrated, to hold them so they could be used in the lathe for threading, and in the shaper or planer for grooving. The holding screws for the clamp were made long enough so that all sizes of chasers could be held. All parts of the toolholder are made of machinery steel and are casehardened.

Application of Continued Fractions to Dividing-Head Problems—Discussion

BY CHARLES KUGLER

An article by W. S. Stainsby, under the title given above, published on page 25, Vol. 63, of the *American Machinist*, dealing with dividing-head problems, and another article by R. B. Willis on page 400, Vol. 63, dealing with gear-cutting problems, both discussed the use of continued fractions. Both articles, however, could have carried out the idea to a greater degree. The method adopted did very nicely as far as the particular requirements were concerned, but we cannot always get a suitable fraction by stopping where their work ended.

The writer once had the job of drilling two holes at an angular distance apart of 53 deg. 16 min. 48 sec. The work was done on a Brown & Sharpe dividing head having index plates with holes as follows:

15, 16, 17, 18, 19, 20,
21, 23, 27, 29, 31, 33,
37, 39, 41, 47, 49

Since the ratio of the dividing-head gearing is 40 to 1, and since there are 360 deg. in a circle, each turn of the index crank will give a movement of 360 deg. divided by 40, or 9 deg. The next lower number of degrees available by complete revolution of the handle is 5 times 9 deg. or 45 deg. This number, subtracted from 53 deg. 16 min. 48 sec., leaves 8 deg. 16 min. 48 sec. Reduced to seconds, it amounts to 29,808 sec. One complete turn of 9 deg. is equivalent to 32,400 sec. Our fraction above 45 deg., or five complete turns is therefore, $\frac{29,808}{32,400}$

Dividing the fraction by the highest common factor, 1,296 we have 23/25 as the result.

On the Brown & Sharpe dividing head there is no 25-hole circle and we must, consequently, get a fraction close to 23/25 that will be available for our purpose.

The continued fraction, as worked out in the article by W. Stainsby, is:

$$23)25(1$$
$$\underline{23}$$
$$2)23(11$$
$$\underline{22}$$
$$1)2(2$$
$$\underline{1}$$

and it gives us the fractions $\frac{1}{1}$, $\frac{11}{12}$ and $\frac{23}{25}$.

It will be noticed that the fraction $\frac{11}{12}$ is the only one that approximates our original reduced fraction $\frac{23}{25}$, found from the ratio of degrees. It seems, therefore, in view of the fact that neither 12 nor 25 are to be found on the index plate, that continued fractions fail us here.

However, we may carry the system further than does W. Stainsby in view of the face that there are 11 — 1, or 10, more convergents between $\frac{1}{1}$ and $\frac{11}{12}$, since $\frac{11}{12}$ is the second fraction in the sequence. The fractions between these values will be:

	I	II	III	IV	V	VI	VII	VIII	IX	X
Numerator	1	11,	12	23	34	45	56	67	78	89	100	111
Denominator	1	12	13	25	37	49	61	73	85	99	109	121

IDEAS FROM PRACTICAL MEN

It will be noticed that the first two fractions, $\frac{1}{1}$ and $\frac{11}{12}$ are added together to produce the first fraction of the new series, $\frac{12}{13}$. To this number $\frac{11}{12}$ is added successively to produce the other intermediate fractions.

In this series, $\frac{34}{37}$ should be used since we have a 37-hole circle on the Brown & Sharpe head. The accuracy will be $\frac{23}{25}$ minus $\frac{34}{37}$ or 0.92 minus 0.9189. The subtraction will give 0.0011 difference.

For the example stated by Mr. Willis, using the fraction 144/479, we have:

$$
\begin{array}{l}
144)479(3 \quad Q_1 \\
\underline{432} \\
47)144(3 \quad Q_2 \\
\underline{141} \\
3)47(15 \quad Q_3 \\
\underline{45} \\
2)3(1 \quad Q_4 \\
\underline{2} \\
1)2(2 \quad Q_5 \\
\underline{2} \\
1
\end{array}
$$

Using the system of continued fractions, again, we have the fractions:

$$\frac{1}{3}, \frac{3}{10}, \frac{46}{153}, \frac{49}{163}, \frac{144}{479}$$

	I	II	III	IV	V	VI	VII	VIII
Numerator	1	3	4	7	10	13	16	19	22	25
Denominator	3	10	13	23	33	43	53	63	73	83

	IX	X	XI	XII	XIII	XIV	XV
Numerator	28	31	34	37	40	43	46
Denominator	93	103	113	123	133	143	153

Therefore, we may find another series of convergents intermediate between any two principal convergents if the quotient from which the last of the two principal convergents was derived is greater than one. The number by which this quotient exceeds one, will be the number of convergents we can find between any two principal convergents. In the above case there will be fourteen convergents between 3 and 15, the quotients Q_1 and Q_2 in the above solution.

We may use the formula:

$$\frac{N_2 + MN_1}{D_2 + MD_1},$$

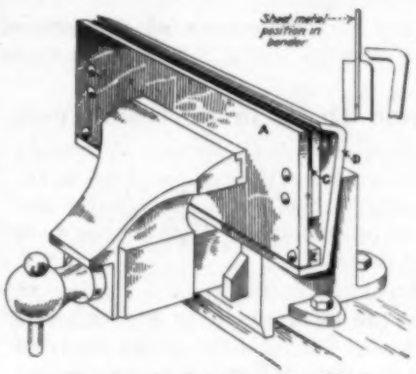
where M is given successively the values 1, 2, 3, etc., and where N_1 and N_2, D_1 and D_2 are numerators and denominators corresponding to the above mentioned quotients.

A Bender for Sheet Metal

BY G. A. LUERS

A device that will be found very convenient for miscellaneous jobs of bending is shown in the illustration. The bender is very simple in construction and is intended to be used in an ordinary bench vise. As shown in the sketch, the bender is made from two pieces of steel plate, loosely secured at the lower edges.

To the steel plate A, both the retainer B and the spacer C, are tightly riveted. The plate D is bent at the top, as shown, and is loosely attached to plate A by rivets, one at each end, thus forming a movable joint. The block E is of the same thickness as the retainer and is interposed between the lower parts of plates A and B. The bender will make a right-angle bend in any light metal and, in addition, can be used for making preliminary bends for joining sheets together by seaming, or for turning over the edges of metal so they will not be liable to cut the fingers.



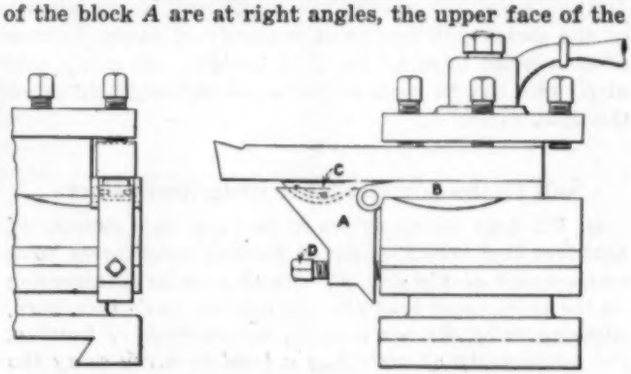
Handy device for bending metal sheet

Tool-Supporting Device

BY ROBERT W. HAGGAR

The device illustrated was designed to support the overhang of long, projecting tools, and can be used in lathes, shapers, or planers. As shown, it is in use on a 4-station toolpost. All parts are made from machine steel, pack hardened.

The triangular block A is $\frac{1}{8}$-in. narrower than the tool it supports, so that it will not interfere in any place the tool will go. When the shank B and the rear face of the block A are at right angles, the upper face of the equalizing segment C should be somewhat lower than the upper face of the shank, to permit a greater range of adjustment.



Support for an overhanging tool

In use, the tool rests on the shank B and is clamped in the usual manner. The setscrew D is then turned until the segment C contacts with the under side of the tool.

It is obvious that the tool, thus supported, can not dig into the work being turned or planed.

When used on a planer or shaper, the tang is placed behind the tool, and the block A adjusted when the clapper is in the cutting position.

Practical Shop Problems

Questions of a Practical Nature will be answered in these columns

More Service from Drills in Portable Tools

Q. We use a great many drills in portable electrically driven machines for work on light-gage sheet metal. These drills are mostly 3/32 and 1/8 in. in diameter and the breakage seems to be excessive. What can we do to get more service per drill?

A. Most of the breakage is doubtless occurring on new drills, where the unsupported length is a factor of weakness accentuated by the inability of the operator to keep the portable machine in line. We suggest that you buy straight-shank drills and make up a quantity of sockets all of the same outside diameter from about ½-in. cold-rolled or machinery steel. The sockets should be drilled in sets to make close fits for the two sizes of drills and in lots of varying depths. The socket shanks can be left straight to fit the drill chucks or can be shaped to the design in the driver.

The depth variations should be in steps of about 1 in., the first being for new drills to let them into the sockets, so that not more than 1 in. of the drill is exposed. A stock of new drills can be sweated with a bit of solder and a gas flame into the first lot of sockets and then put into service.

With only an inch of unsupported length, they will last much longer. When they have worn too short for further use, they can be removed by heating the sockets to melt the solder and swetted into the next lot of sockets, so the next inch of useful length is exposed. If they break in service, the break will occur outside of the sockets, in the great majority of cases, instead of at a point to make the drill useless. As many sets of sockets can be used as there are inches of flutes on the drill.

Salt Baths for Heat-Treating Steel Parts

Q. We have an operation to perform in a process of heat-treating which involves heating steel parts to a temperature of 450 deg. F. Please give us information on the proper salt bath that we can use to do this work, advising us of the components, the methods of heating, the advisability of installing a hood to carry away the fumes and the operating precautions to observe.

A. A salt bath that can be used for your heat-treating operation consists of 55 per cent of sodium nitrate and 45 per cent of sodium nitrite. The melting point of this mixture is at 430 deg. F. and its useful range is between this point and 800 deg. F. Another mixture of 55 per cent of potassium nitrate and 45 per cent of sodium nitrate melts at 425 deg. F. and has a useful range up to 900 deg. Fahrenheit.

It is always advisable to install a ventilating hood over a bath of this type to carry away the heat and fumes although we understand that the latter are not particularly dangerous. The question is principally one of correct ventilation in the working department.

Care must be taken with the bath in its molten state that nothing inflammable be brought near it on account of the aggravated danger of fire due to the oxygen being liberated.

Salt-bath containers are usually made of cast iron or pressed steel, the usual shape being circular. Burners are arranged at the bottom in a manner to distribute the heat and to avoid hot spots on the container shell. Rectangular containers should ordinarily be avoided if it is possible.

If the parts to be heated have sharp corners or thick and alternately thin sections they should be preheated before they are immersed in the bath.

Glue in the Grinding Room

Q. Can you direct us to reliable literature on the proper use of glue in connection with work in the grinding and polishing room? We do not operate many stands, but we have enough work to make it worth while to carry on this important part of building up and caring for our wheels economically.

A. A practical and highly instructive booklet on the subject has been written by Bradford H. Devine, president of Devine Brothers Co., Utica, N. Y. The information is the result of his personal experience in the grinding field.

There are a number of things about glue which are very little known, such as the fact according to Mr. Devine, that glue will lose 5 per cent of its strength for each hour it is kept heated, that there is no real excuse for a disagreeable odor, that drafts have a serious effect, that heat does not necessarily hasten setting, and many others.

These points are covered in the booklet to advantage.

Heat-Treatment for Oil-Hardening Tool Steel—a Correction

A recommended heat-treatment for an oil-hardening tool steel was published on page 484, Vol. 63 of the *American Machinist* in answer to a specific question.

Since publication it has been brought to our attention that the answer may be a misleading one in that there are varying kinds of oil-hardening tool steels which require individual treatment. Further, the size and shape of the die have a decided effect on the temperatures to which a given steel should be raised before grinding.

While, therefore, the answer as published was correct for the question asked of us, we suggest that the purchaser of an oil-hardening steel secure the maker's recommendations rather than to attempt heat-treatment to any hard and fast rule.

Characteristics of Stellite

STELLITE, a product of the Haynes Stellite Co., Kokomo, Ind., is a cast metal of exceptional hardness composed chiefly of cobalt, chromium and tungsten. It is proof against practically all acids and chemicals, it will not rust, it is non-magnetic and, except for slight changes in color, it is not affected by heat up to 1,500 deg. F. It is slightly tougher at dull-red heat than when cold. Due to its properties, stellite requires no heat-treatment, and, on account of its hardness, it can be machined only by grinding, taking a permanent silver-white polish.

Uses of Stellite

The field of application of stellite is wide, the most important uses being metal-cutting tools, cutters, forming tools, knives, cutlery, instruments, chemical apparatus, bearings, bushings, cams, rollers,

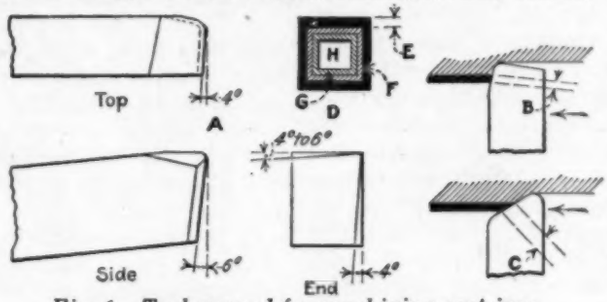


Fig. 1—Tool ground for machining cast iron

gages, punches, bending tools, forming dies, drawing dies, valves, valve seats, thrust washers, radio mirrors and similar specialties.

Cutting Tools

The principal use of stellite is in the form of metal-cutting tools for machining cast iron, malleable iron, mild steel, steel castings, bronze and aluminum. The advantages claimed are that it will render longer life of the cutting edge and permit the use of increased speeds and feeds over other forms of tools, thereby increasing production and reducing labor costs. The cutting edge of the tool is ground slightly different than the practice followed for tool steels. Fig. 1, at *A* shows a typical grind for machining cast iron and malleable iron. The end clearance should not exceed 6 deg., the top clearance or rake should range between 4 and 6 deg., and the side clearance should be 4 deg. or less. The contour, or shape of the nose, may be made to suit the work being cut but it is recommended to follow the shape shown at *B* so that the contact of the tool to the work-scale will be no greater than is absolutely necessary. At *C* is shown a grind often followed where the contact of scale is excessive.

It is important that the operation of a stellite tool should be applied at a higher cutting speed than other tools for, if it is not run fast enough to bring the cutting edge to a sufficient heat, the tool will not perform satisfactorily and will not offer increased production and longer tool life.

Because stellite tools are cast to shape the outer surface is slightly harder than the center portion. At *D* is shown a cross-section of a tool, *E* representing the hardest portion, *F* the next hardest portion and *G* and *H* the parts that should not be used for cutting. By carefully grinding the cutting tools it will not be necessary at any time to use the center portion for a cutting edge.

Grinding Tool for Mild Steel

Vibration and lack of rigidity will often cause a stellite tool to fail in spite of the fact that the cutting point is ground properly. The overhang at the cutting edge should be reduced to a minimum, the underneath support should be flat so as to offer a good clamping surface and the clamp should be made flat in form rather than using the usual type of setscrew which is likely to break the tool.

For mild steel and steel castings, stellite can be used to advantage but the results will depend on the shape of the cutting edge used. Fig. 2 shows a recommended grind for this type of material. It may by termed the "negative point" or "drop grind" as the tool slopes down toward the center of the material being cut rather than having a back slope. The angles shown may vary slightly to suit particular requirements but they should be combined as illustrated. The use of stellite for high-carbon or "stringy" steels does not show enough increase in economy over other tools to warrant its use although on some work it has been found to offer an increase in cutting life. It is important to grind the tools with the flat side of wheel as indicated at *A*. If the circular side is used, as shown at *B*, the angles are generally increased, reducing the support of the cutting edge with the result of a short-life tool.

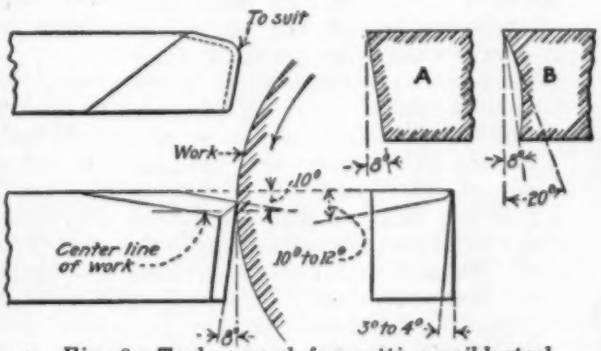


Fig. 2—Tool ground for cutting mild steel

The grinding requirements of stellite are not more difficult than those used for other tools but merely different. It is necessary, however, to follow stellite practice in order to expect the best results and cutting qualities that the tool offers.

The machine tool to which stellite is to be applied should be in good condition, being free from loose adjustments and end play in the various working portions. If a tool is ground properly and held rigidly and yet fails to produce proper results, the cause can be generally traced to some minor misadjustment or misalignment on the machine.

(To be concluded)

For the data given we are indebted to the manufacturer.

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Punch here to suit your binder

Technical Abstracts

Twist Drills

F. A. Kelley of the Cleveland Twist Drill Co. points out that drills must be differently constructed for different operations. Different drills will be required for drilling oil holes in crankshafts, oil and cotter-pin holes in shackle bolts, brass, slate, aluminum, bakelite and wood. One type would not penetrate all of them with the highest degree of efficiency in production and tool life.

Crankshaft drills must have free cutting qualities and be built rigid enough to withstand the comparatively high torque strains caused by the toughness of the material and great depth of the hole. The mechanical characteristics of this drill are a great helix angle to provide free cutting, wide flute to allow free egress of the chips and a heavy web to provide rigidity. For drilling bakelite, a drill with wide flutes to allow for rapid egress of the chips is necessary. In this case a very thin web is maintained. This drill performs well in such materials as bakelite, formica and hard rubber.

Strange to say, aluminum appears to demand a drill of the same type as that used for slate, with the exception that the web is built somewhat heavier to provide greater strength. Brass demands a drill of great strength, largely on account of the rather heavy feeds usually used. — *The Foreman's Magazine*, Sept., 1925, p. 9.

Heat-Treating Key to Success

That the heat-treating department is often a key department in manufacturing is maintained by E. L. Shaner in describing the heat-treating methods of the Ferry Cap & Screw Co., Cleveland, Ohio. After calling attention to the rapid progress made in the development of heat-treating and of the automatic and flexible types of equipment he outlines the processes through which the products of this company pass. This material is worked down from bar stock or from wire, in most cases involving forging or machining. All alloy steel and 0.20 per cent carbon steel is heat-treated. To accomplish the handling of quantities of varied products a flexible and efficient system is required and it consists partially of special machinery designed by the company.

One example of special equipment is the battery of two furnaces for normalizing bolt-heads. Each furnace has a long heating chamber through which the bolts are conveyed on a link belt. On the belts are nickel-chrome containers that insulate the bolts from the heat.

In the casehardening department the container boxes are taken from the furnaces by an overhead trolley system and dropped to the incline chute. They slide into the bath and belt conveyors pick them up and dump them into tote boxes. Conveyors are used between the two floors of the heat-treating department.

The company designed their own washing machine which consists of a rotary drum containing baffle plates. The plates pick up the parts and let them fall through the washing compound which is a common soda solution, or rust-proof slushing compound.

Three applications of the same principle described may be used in quenching dies. In one case there are two heads for holding the die in a horizontal position. The die is removed from the furnace and placed between the two heads which are tightly pushed together to hold the die firmly. The weight of the die lowers the entire device into the bath where opened valves shower it from both directions before immersion. The other two instances provide for quenching in a vertical position. The die-holder is counterweighed to swing it up and down into the water. In one case a shower feeds upward and in the other case downward.

The heat-treating department is provided with many continuous furnaces for handling the product on a production basis and with many special-purpose units for long-drawing annealing and other operations. Gas, oil-fired and electric units are used, the oil-fired supplementing the gas in case of shut-downs on this fuel.—*Iron Trade Review*, Sept. 17, p. 683.

The Stroboscope

The features required in a satisfactory form of stroboscope can best be made clear by a short study of the action of an elementary pattern of the device consisting of a stationary disk *A*, and a rotary disk *B*, each having an equal-sized radial aperture in it. With the two disks mounted coaxially and *B* set rotating we may take as our object of observation a rotating disk *C*, one portion of the surface of which is distinguished by a chalk mark. Once during each revolution of *B* vision will be permitted through the slots in the two plates. Quantitatively it will occupy the time taken by *B* to turn through an angle twice as great as the angle subtended by the slot. Assuming that the disk *C* is a gear wheel and we are observing a particular tooth, if the speed of one disk be slightly reduced to one r.p.m. less than the speed of the gear wheel, then during one revolution of the disk the gear wheel will make something more than one revolution. In other words at the second glimpse the gear tooth will be slightly to the right of the zero position. The amount of its advance divided by the time taken by the stroboscope disk to make one turn gives us the apparent velocity of the gear wheel as seen through the stroboscope. If the reduction of the disk speed is continued until the advance registered by the tooth during one turn of the disk is just equal to half the pitch distance, the apparent motion of the wheel will become a dance backward and forward through a range of half the pitch.

Many forms of stroboscope have been devised, all depending upon the principle of intermittent vision. In the manner of securing the intermittency is to be found the chief feature distinguishing one form from another. A new type called the rotoscope, introduced in Europe, is discussed in full.—*The Engineer* (England), Sept. 11, p. 272.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Organized Labor Accepts Machinery

AT THE recent meeting of the American Federation of Labor at Atlantic City a resolution was adopted that indicates a big advance in the attitude of organized labor toward labor-saving machinery. The significant sentences are these:

"We urge upon management the elimination of waste in production in order that selling prices may be lower and wages higher. To this end we recommend co-operation in study of waste in production."

"Social inequality, industrial instability and injustice must increase unless the workers' real wages, coupled with a continuing reduction in the number of hours making up the working day, are progressed in proportion to man's increasing power of production."

Apparently the only interpretation of these statements that is possible, is that labor recognizes the place of mechanical labor-saving equipment in the modern production scheme and desires to co-operate with management in using it to the best advantage. At the same time it is only natural that labor should seek a share in the savings made possible through the use of such equipment.

The more thoughtful labor leaders and many of the rank and file have long held these views but it marks a real advance to have them set forth in a resolution and adopted officially.

Airplane Building as a Field for Machine Builders

A FEW years ago some of the over-optimistic machine builders looked to the airplane to replace the automobile as a field for their products. And because it did not, and has not, they have become pessimists in regard to aviation development.

The growth of airplane building has been discouragingly slow to its friends. But there is a reason—several of them in fact.

The war left a lot of planes and thousands of Liberty engines on our hands. The planes have, fourtunately, very largely gone by the board. Truth to tell, few of them were as good as they should have been. The engines have proved surprisingly good and there are still many of them that have never been used.

Another reason for the delay in aircraft development has been the lack of a real program in spite of the claims to the contrary. Both army and navy have been building airplanes that should have been built by private builders, after the policy of Great Britain. Builders of both airplanes and engines have not received the encouragement warranted by their equipment and experience. This condition is evidently to be improved if reports are authentic.

The time is approaching when the building of airplanes and of airplane engines will begin to require machine equipment. The use of metal in planes is increasing and will continue. Those who neglect the possibilities of business in airplane construction will be sorry in days to come.

Why Not Date Catalogs?

A LETTER from the general superintendent of a big manufacturing company in the machine field complains of the lack of dating or numbering on catalogs, bulletins, pamphlets and the like. The point is a good one—why aren't they dated?

There may be several reasons for not doing so but aren't they heavily outweighed by the fact that considerable vexation is caused to a possible customer when he is unable to discover when the catalog in his possession was issued and whether or not it is up to date? An undated catalog is just about as useful as an undated copy of the "American Machinist." There is plenty of information but you can't be sure how recent it is. And as a catalog often takes the place of a salesman as the representative of a company isn't it just as desirable to have it make a favorable impression as to have the salesman skilled in opening an interview?

Just Suppose

JUST suppose, that while doing your work as foreman, you could find the time each day and the way to get a bit of a personal line on the boys at the machines. Perhaps you could get them to open up and tell you a thing or two. If you had known that Harry quit just because he was kept at one thing when he ached for a bit of variety, that John lost two days at home with his sick wife when you could have sent the company nurse had you only known, that Bill knows of a chap who would just fit on that troublesome punch-press job, that the inspector has the dope on a number of points you could put across to his credit, and yours.

Wouldn't it be good fun to try a little human stuff without any "white-collar" talk or "high-hat" stand. You might even help yourself a bit by helping someone else—say!

Just suppose.

Shop Equipment News

Biax Flexible Shaft Equipment

An unusually complete line of flexible shaft equipment that includes a variety of driving units and work attachments for all the purposes for which flexible shaft equipment can be used has been put on the market by the Biax Flexible Shaft Co., Inc., 136 Liberty St., New York, N. Y. The equipment can be employed for grinding, buffing, drilling, screw driving, bolt setting, die sinking, scratch finishing, polishing, sanding, tube cleaning, casting cleaning, and many other operations. The shafts range from 0.157 to 1.18 in. in diameter and can be furnished with driving units that vary in power from ⅛ to 2½ hp. and in speeds from 1,000 to 4,000 r.p.m. In the smaller sizes the shaft itself is extensively used for driving speedometers.

One of the driving units attached to the shaft and the assembly fitted with one style of the many available grinding attachments is illustrated in Fig. 1. The motor is mounted above a base section and the whole assembly is arranged on a compact portable platform. The motor can be furnished for either d.c. or a.c. current at 110 or 220 volts, the a.c. current being at 60 cycles. The drive is through a set of cone pulleys and belt with a tightener for maintaining the proper belt tension. With this arrangement, varying speeds are obtainable to suit the requirements of the work. The starting controller is mounted on the side of the base. The motors are of special design, full ball bearing, and dust proof so they can be operated under all adverse conditions. They will carry 100 per cent temporary overload and 50 per cent continuously.

Another driving unit with a shaft and grinding attachment is shown in Fig. 2. This unit is designed to be suspended either in a stationary position overhead or on a conveyor track. The motor shown is for d.c. current but can be furnished to specification for a.c. current if desired.

In addition to the motor drives, of which there are many variations, there are tight and loose pulley units available that are designed for belt drive from any convenient source

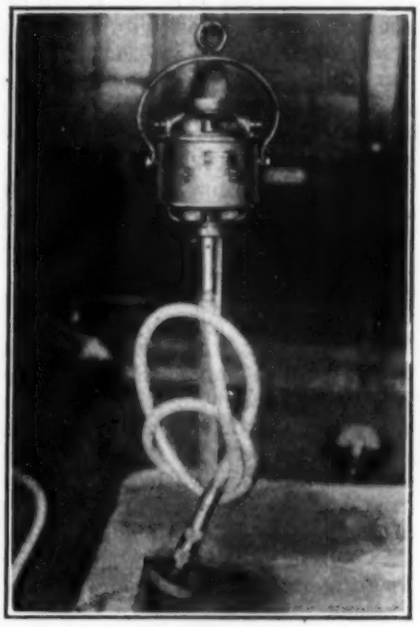


Fig. 2—One of the overhead grinder drive arrangements

of power. These units are self-contained and require no work to put them in service other than attachment to a suitable support.

Finally provision has been made by the design of fittings for the drive end, either straight or taper shank, for attachment of the flexible shaft to an electric drill or stationary machine by simple insertion of this fitting in the spindle socket or tool chuck.

To indicate its construction, a piece of the flexible shaft is shown in Fig. 3. The outer casing is made of zinc plated steel and is oil tight. Inside this casing is a coil of tempered steel wire, flat in section, to provide strength and flexibility for the casing. At each end, not shown in the photograph, is a reinforcement mounted outside of the casing to protect the assembly at the points where the greatest strain

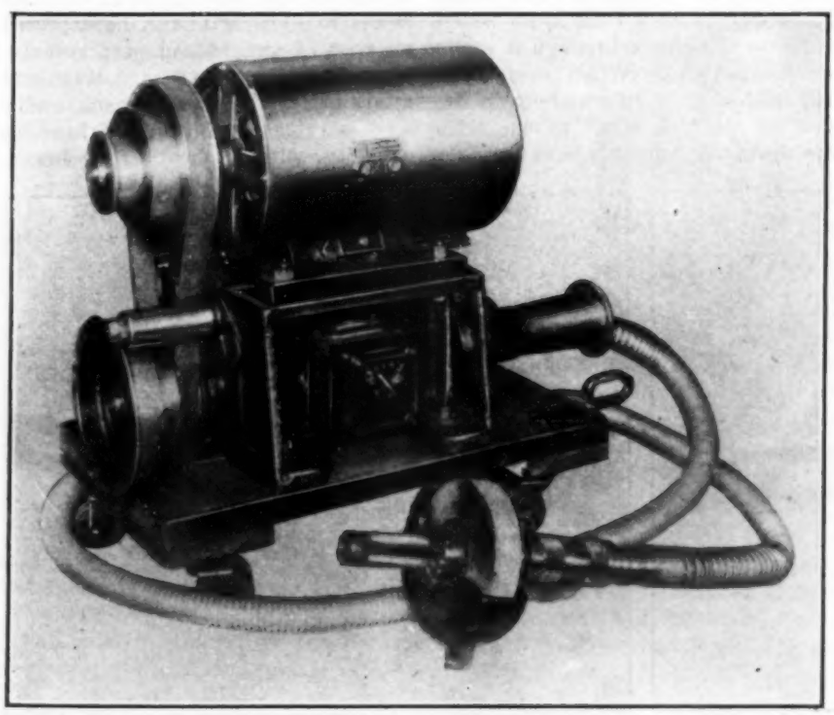


Fig. 1—Biax Flexible Shaft and Driving Unit With Grinding Head

SHOP EQUIPMENT NEWS

is imposed. This reinforcement can be seen in Fig. 1 to advantage.

The core consists of a number of coils of special cold-rolled piano wire wound in opposite directions as to successive coils. There are several strands in each coil which are wound as a unit to increase the pitch over that which would obtain were one strand used. Great care is used in the winding, the work being done on specially-built machines.

The shaft is designed to run in but one direction although it can be operated "backward" with a sacrifice of 20 per cent of its transmitting capacity. There are two windings furnished, however, so there is very seldom any need to reverse the recommended direction. The definition of correct rotation is that which will tend to close the several windings in the core upon each other. The Biax standard right-hand shaft is defined as wound to rotate counter clockwise when facing the source of power.

A fitting which terminates in male threads and a substantial flange is fitted on to each end of the core to screw into the driving fitting on one end and the driven fitting on the other. Lubrication with any accepted grease is recommended for the shaft after each 48-hr. period of active service. Lubrication is accomplished by sliding out the inner core greasing and then replacing it.

There are two styles of Biax hand pieces, as the fittings are called, to which the working units are attached. Both are full ball bearing and will run continuously without heating. One contains a clutch that is operated by sliding a sleeve in an axial direction and is illustrated in Fig. 4. As stated, it is screwed on to the threaded driving fitting on the shaft. It can be supplied with a Morse taper, a cylindrical spindle, or another threaded end.

The particular advantage of this hand piece is that the tools can be

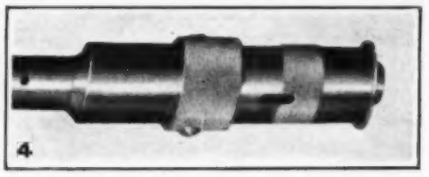


Fig. 3—A section of the shaft
Fig. 4—The clutch-hand piece

stopped or started without shutting down the source of power. The other hand piece is similar in design but has the clutch and shifter collar omitted. Spindles to carry tools of all descriptions can be ordered for insertion in either style.

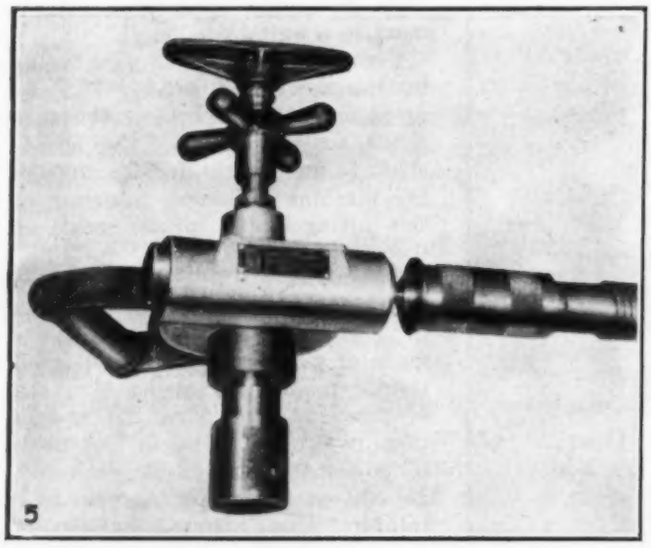
Two of the numerous styles of workheads are shown in Figs. 5 and 6. In Fig. 5 is a drill head which drives to the chuck through a worm and wormwheel. When desired, a drill holder can be furnished, in the form of an "old man" to use with this head in which pieces can be drilled with the head firmly backed up and the screw feed used to advance the drill. Another head is furnished, for higher speeds, of approximately the same outline as this one but driving through spur instead of worm gearing. The shafts all run on ball bearings.

The body of the head is of aluminum and is packed with lubricant. Only occasional renewal of grease is necessary.

A combination head is illustrated in Fig. 6 that can be used to advantage for wood screw driving or for bolt and nut setting. In the former operation, a drill to make the hole is carried in the chuck that lies in line with the drive while the screw driver is held in the socket which is set at 90 deg. and at almost the same operation the screws can be driven.

A spring-operated clutch in this attachment keeps the screw-driver fitting from rotating until pressure is brought to bear on the handle. This clutch also acts as a release at the bottom of the drive when the screw is set. For bolt setting, a socket to fit the bolt head is used in the head in place of the screw-driver fitting.

The company has prepared a catalog illustrating and describing the complete line and giving capacity tables to show what can be expected by way of guaranteed performance, and stands ready to demonstrate and guarantee that the equipment, under any service condition within its capacity, will not heat up or break.



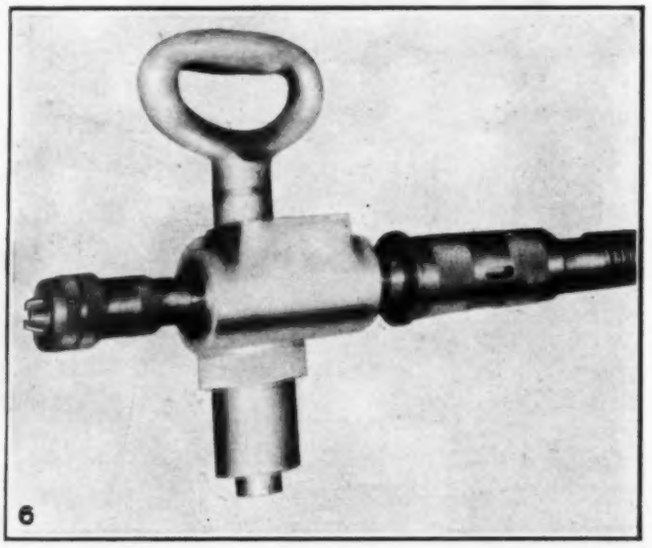


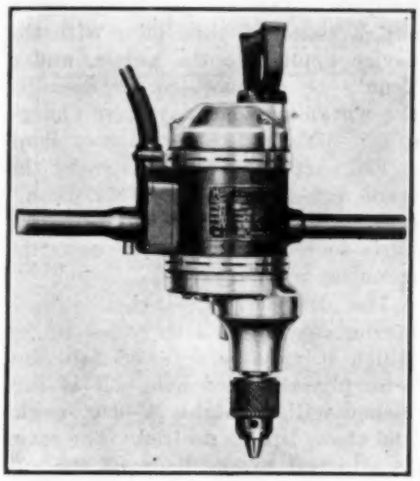
Fig. 5—A worm-drive drilling head. Fig. 6—A screwdriver and bolt-setting head

SHOP EQUIPMENT NEWS

Hisey Universal Drill ⅝-Inch

The universal drill of ⅝-in. capacity, illustrated, and another size of ½-in. capacity, both measured in steel, have been added to its line by the Hisey-Wolf Machine Co., Cincinnati, Ohio.

The motor is built by the company and follows its standard design. The armature is hand wound with the



Hisey Universal Drill, ⅝-Inch

lead ends firmly banded in place. The rotor rides on ball bearings at both ends with the drive end fitted to float in a hardened cast-in sleeve.

Felt washers are provided to protect the bearings and to retain the lubricant.

Forced ventilation is set up by a balanced fan fitted and keyed to the armature shaft.

The brush holders have an adjustable spring tension to hold them in place and are mounted as a separate unit on a bakelite yoke designed to permit of adjustment to advantage.

The spade handle is located in line with the spindle and is attached to the end cover. This cover, in turn, is a rugged casting and is bolted to the housing independent of the motor bearings.

The gears are carefully proportioned for the work that is expected of the drill. The motor pinion is removable. All are made of high grade steel and are heat-treated.

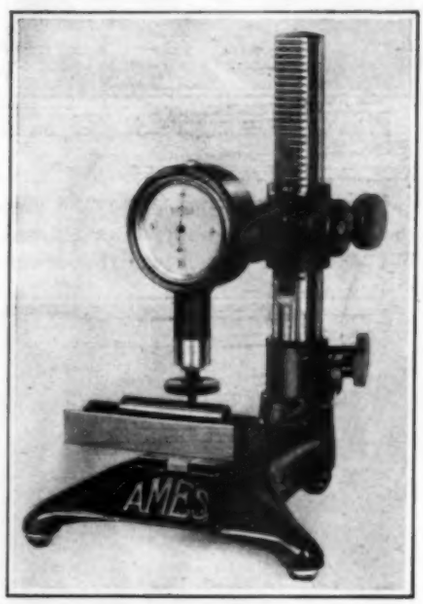
The chuck spindle is hardened and ground and is lubricated from the gear case. A thrust bearing is located at its end and is amply protected. The spindle is bored for a Jacobs chuck which is included.

The drill can be furnished for either 110- or 220-volt current and weighs 35 pounds. Ten feet of rubber cable and a suitable attaching plug are furnished. When so desired a No. 1 Morse taper socket can be provided in place of the chuck.

Ames Dial Comparator

The dial comparator illustrated has been built and put on the market by the B. C. Ames Co., Waltham, Mass. It is designed to meet the requirements for general testing, measuring, and inspecting of cylindrical and flat parts. Roundness and diameter of bearings, shafts, screw-machine products, bushings, pins, and similar parts can be checked for accuracy while in process or after completion. The same work can be done on flat parts after removing the V-block shown in the illustration.

The dial gage is set on the column, to suit the work in hand, by loosening a clamping screw and turning the adjusting nut. Final setting of the gage to zero can then be made



Ames Dial Comparator

by adjusting the contact point against a standard reference piece.

The parts to be tested are substituted one at a time for the standard part and will register their variation, over or under the standard, on the dial.

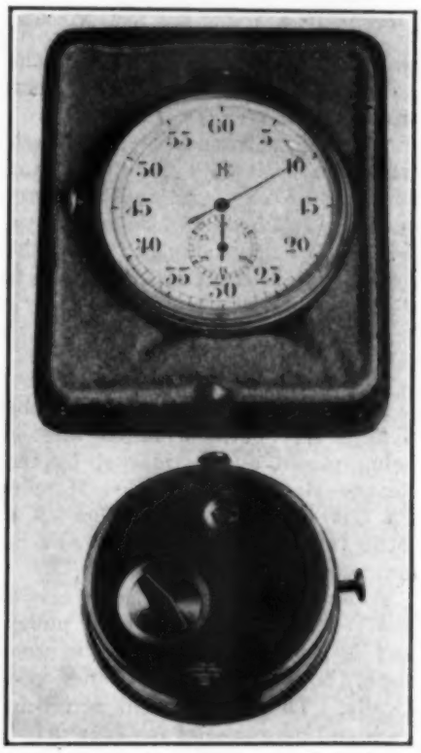
The instrument can be used by unskilled operators and is said to be accurate to within 0.0002 inch.

Zernickow Laboratory Timer Stop Watch No. 300

The O-Z laboratory timer stop watch, marketed by O. Zernickow Co., 15 Park Row, New York, N.Y., is intended for precision work in scientific laboratories, technical colleges and for such work as testing and calibrating.

The starting and stopping mechanism, which is patented, is operated by the two buttons which may be seen on the side of the watch illustrated.

The dial is graduated to ⅕ seconds and each five seconds are numbered



Zernickow Laboratory Timer Stop Watch, No. 300

consecutively toward the right of the dial. Other special graduations may be furnished, one with a decimal graduation of 1/100 minutes.

A special design, No. 301, is arranged with electrical contacts so as to interrupt the current range between 7 and 14 volts which may be passed through it. An adjustor on the back of this model can be set to give the interruptions at regular intervals. The diameter of the watch is 2½ in. and the height is ⅛ in.

SHOP EQUIPMENT NEWS

Husky Handy Ratchet Set No. 55

The handy ratchet set No. 55 is being manufactured by the Husky Wrench Co., 928 Sixteenth Ave., Milwaukee, Wis., and is suitable for uses such as those for which the standard combination wrench sets are designed.

The tool is made of hardened steel and nickel-plated. The ratchet can be reversed by means of a "push-thru" plug which may be seen at the left end of the ratchet, in the illustration.

Husky Handy Ratchet Set No. 55

There are six sockets in the set, which are nested in the illustration and range from $\frac{1}{2}$ in. to $\frac{7}{8}$ in. hexagonal sizes. The set also includes a 7-in. extension slipped into the hollow handle of the ratchet which is 9 in. in length.

Reznor Belt Shifter

A device for shifting belts on cone pulleys has been designed and is being placed on the market by the Reznor Manufacturing Co., Mercer, Pa. It is shown in position on a lathe in Fig. 1 while in Fig. 2 is a view at the countershaft.

A square steel bar passes across the front of the lower cone pulley and is set at an angle to the cone shaft both horizontally and vertically. This bar is held firmly at each end by a special fastener utilizing the bolts of the spindle bearing caps. On this bar slides a shifting block with a handle on the outer side and on the inner side a loop through which the belt passes.

At the upper cone pulley a similar square bar is set on the opposite side of the cone, and is carried by special drop supports of pipe. A shifting block rides on the upper bar with a shifting loop for the belt and is moved along the bar in the required direction by means of a length of steel block chain which is attached to the block and which then passes over a small steel pulley at each end of the bar. A similar chain

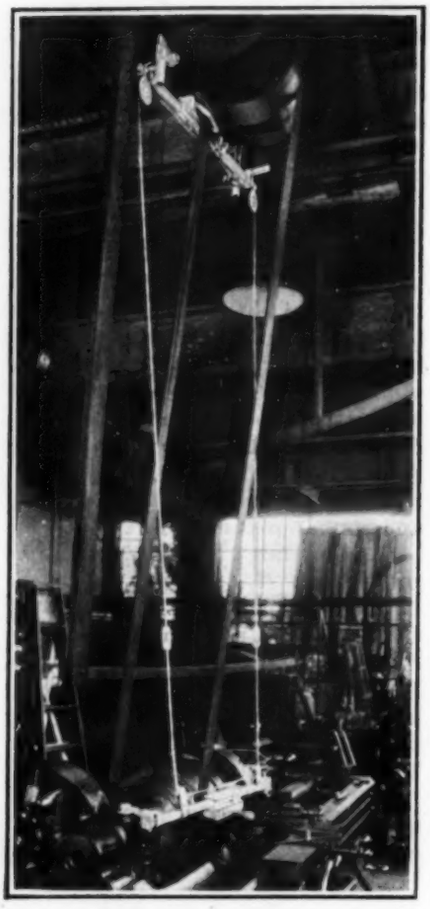


Fig. 1—Reznor Belt Shifter on a Lathe

is carried above the lower bar and through similar pulleys as shown, but does not attach to the lower

Fig. 2—The arrangement at the countershaft

shifter block. The chains are connected by rods.

While a shift requires two movements, the time required is negligible and the operator need give no attention to the belt.

Rivett "Forkup" Oiling System

The Rivett Lathe & Grinder Corporation, Brighton district, Boston, Mass., has brought out a complete oiling system to be applied to machines, line shafts and countershafts, automobiles, or to whatever type of mechanism may require the introduction of fluid oil as a lubricating medium. The system comprises a cup, a standard hand oiler with the device applied to the nozzle, and a "gun"—or syringe—to be used by the workman who may have charge of all oiling in a department or shop.

The parts are to be known by the trade names of "Forkup," "Forkan," and "Forgun." Fig. 1 shows all parts together and Fig. 2 shows the essential details.

The cup is a steel shell with a spring cover and a threaded tip by which it may be screwed into any $\frac{1}{8}$-in. pipe-threaded hole. It is furnished with straight, 45-deg. angle, and elbow tips as desired. The cover is attached to the body of the cup by a compression coil spring in such manner that it cannot be removed without the aid of a special tool made

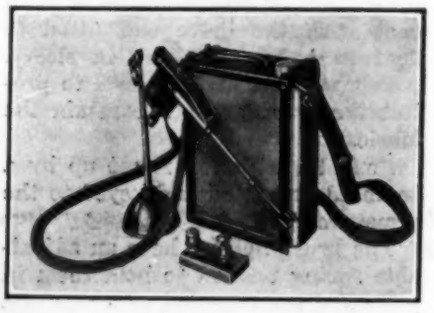


Fig. 1—The "Forkup" Oiling System

for the purpose. As the spring is in compression, it cannot be stretched so as to allow the cover to become loose.

Attached to the cover is a valve that, when the cover is seated, closes the outlet through the tip and allows the oil to escape to the bearing only by seeping through a felt washer that is a part of the valve. When the cover is raised the valve is also lifted and allows the oil to flow freely to the bearing to which the cup is attached.

The fork feature may be seen to advantage in Fig. 2, wherein it is shown applied to the nozzle of a hand

SHOP EQUIPMENT NEWS

oiler with the latter in position to fill the cup with oil. The shape of the fork and its position with relation to the end of the nozzle are such that when it is applied to the cup it wedges up the cover of the latter and allows the end of the nozzle to enter the cup.

Two advantages are claimed for the device. The workman does not have to touch the cup with his hand, and therefore but one hand need be used, a condition that will be greatly

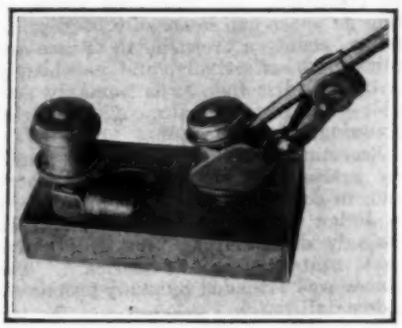


Fig. 2—Details of fork and cup

appreciated by anyone who has to climb a ladder to oil overhead bearings. Dust, dirt or abrasive particles clinging to the outside of the cup or cover are scraped off by the fork when it is first applied and cannot get into the cup with the oil.

When the valve is lifted, by raising the cover of the cup, a free flow of oil passes at once to the bearing to flush it. When the device is withdrawn the valve seats automatically, shutting off the flow and allowing only the seepage through the felt to reach the bearing.

The "Forgun" is a compression syringe, attached by a suitable length of rubber tube to a standard 1-gal. container which is carried in a light steel frame designed to be suspended by a strap from the shoulder of the workman. A hook on the frame provides a convenient means of supporting the gun when both hands are required to be free, as when climbing a ladder or getting into confined spaces.

The fork of the gun is the same as that applied to the nozzle of the hand oiler and functions in the same manner. The cylinder of the gun contains exactly one cupful of oil, so that the workman has only to apply the fork to the cup and give the grip of the gun a single push. He cannot overfill the cup, nor can he discharge the oil outside the cup, for unless the end of the nozzle is in the cup the fork will not be in position to resist his pressure upon the grip. A spring returns the piston and fills the cylinder of the gun from the container when the pressure is removed.

By means of this device one man, who may have charge of all the oiling in a department or small factory, may cover his rounds without having to carry an extra supply of oil to refill his oiler or to go back to the base of supplies for that purpose. He can also oil machinery in motion without stopping or interfering with its operation and without danger of injury to his hands.

"Hallowell" Home Work Bench

A work bench designed especially for the home or small tool and die shop has been placed on the market by the Standard Pressed Steel Co., Box 4, Jenkintown, Pa.

The legs of the work bench are of pressed steel, while the table is of hard wood. The bench is furnished with a lower shelf and may be had

"Hallowell" Home Work Bench

with or without a drawer, also made from pressed steel. The drawer, 15x14x5 in., is equipped with a tray that measures 8x13½x1 in. The vise illustrated with the bench is not included in the equipment.

The bench is shipped in a knock-down condition with all nuts and bolts included to enable immediate assembly. The dimensions of the bench are 48 in. long, 32½ in. high and 15 in. wide.

This bench increases the present line of "Hallowell" equipment which includes lift-truck platforms.

Rockwell Dilatometric Hardening Equipment

The Rockwell dilatometric hardening equipment, manufactured by the Stanley P. Rockwell Co., 112 High St., Hartford, Conn., consists of a furnace for heating, a Rockwell indicating dilatometer and a recorder if permanent records are to be kept, together with a tank for containing the desired quenching medium. The equipment may be purchased com-

Rockwell Dilatometric Hardening Equipment

plete or in units for application to any electric or gas furnaces capable of close temperature control.

The dilatometer takes advantage of the contraction that steel undergoes when it passes through the critical range after expanding during the heating process, and measures both the expansion and the contraction. When the contraction begins a warning bell sounds so that the operator can be ready for the quenching of the piece. A chart also records the expansion and subsequent contraction of the piece during heating. A quartz tube stands on the work and operates the fulcrum lever. Upon the outer end of this fulcrum lever is the recording mechanism which is operated by the movement of the lever. Both the recording apparatus and the indicator have a magnifying leverage.

The furnace can be equipped with a pyrometer control to regulate the temperature.

News of the Week

Secretary Davis Lays Responsibility of Preparedness on American Industry

Praises work of civilian Ordnance Advisory Board

"The security of the nation is the responsibility of every citizen, and not of the War Department alone," stated Secretary of War Davis, speaking at a luncheon at the Bankers' Club, New York, on Oct. 9. The affair was arranged in his honor by Elbert H. Gary, chairman, United States Steel Corporation, and chairman of the Ordnance Advisory Board of the New York district.

Secretary Davis, who is charged under the National Defense Act with insuring adequate mobilization of the nation's industrial resources, asserted that America's most difficult problem in the warding off of agression is that of munitions and not of man-power.

"There is one great lesson to be learned from our World War experience. Industry cannot win wars, but industry may lose them," said Mr. Davis. "Our most difficult problem in striking a telling blow against aggression is not the man-power problem, but the industrial problem. American troops were engaged in battle a year before we could furnish them with adequate munitions. The measures which you business men and engineers are now taking constitute a most positive assurance that this perilous state of industrial unpreparedness shall never occur again.

Preparedness Is Common Sense

"Industrial preparedness is not militarism; it is just ordinary common sense. It is not preparation for war, but preparation against war. Far from being antagonistic to peace, national preparedness tends to promote peace. The nation which is prepared to defend itself effectively is far less likely to be attacked than the nation which is weak, spineless and unprepared.

"Industrial preparedness is a businesslike effort to meet a great business problem in a business way. We hope that our nation may avoid future wars; but if we are ever forced into war, we must be ready to bring to our defense the entire resources of our nation, both man-power and industrial-power. Industrial preparedness is even more difficult and complicated than the mobilization and training of our armies. Just as we have our trained military minds working out military problems, so we must have our trained industrial and engineering minds working out the complex problems of equipment and supply. The security of the country is not the responsibility of the War Department alone; it is the responsibility of every citizen.

"The planning which will make our economic structure strong to do its part in the national defense cannot be done in time of war; it must be done in time of peace. It is your job as well as ours. It means the saving of literally billions of dollars to the taxpayer if an emergency ever comes again; it means time saved in getting into production, and time saved may mean the difference between defeat and victory; it may well mean the saving of the lives of our boys, hundreds of whom were sacrificed in the last war upon the altar of unthinking unpreparedness.

"So we ask your co-operation with Judge Gary and his Ordnance Advisory Board, who are doing such splendid service in this planning work. I feel that we will have that co-operation in the interest of the nation's security. Knowing that the American business man is essentially patriotic, our plans are based upon the fundamental proposition that, if we are ever again forced into war, there must be no slackers and no profiteers. To keep the peace as long as peace can honorably be kept, to bring about a return to peace as quickly, as effectively, and as cheaply in lives and money, as is humanly possible—that is the aim of industrial planning."

Secretary Davis lauded the "practical patriotism" of American industry and, in concluding, paid a high tribute to Judge Gary who, he said, had been fittingly described as "the great business statesman of America." The dinner was attended by many prominent industrialists.

Accessory Manufacturers in Convention at Montreal

Advise against indiscriminate dumping in foreign markets

A broad picture of the world opportunity for business was presented at the opening session of the Motor and Accessory Manufacturers' Association, in annual convention, at the Mount Royal Hotel, Montreal, Canada, Oct. 7 to 9. Francis H. Sisson, vice-president of the Guaranty Trust Co., of New York, and Merle W. Thorpe, editor of the *Nation's Business*, official magazine of the Chamber of Commerce of the United States, Washington, D. C., were the principal speakers at the opening session.

Upwards of two hundred delegates from the automobile parts and accessory manufacturing companies of the United States attended the convention. These companies make automobile and truck engines, bodies, parts, accessories and machinery and tools for factories and garages.

Mr. Sisson, in his address on the outlook of the business of the world, painted an optimistic picture of the trade of the world during the ensuing months. He pointed out the difficulties which had to be contended with, particularly the situation in Europe and labor troubles there.

In the United States, he said, the analysis of trade reports, without exception, shows the business outlook is for continued improvement and that better trade conditions are developing. He stated that the old philosophy, "live and let live," was not now of much use in the business world. It should now be, "live and help live." It is necessary to do this, so interdependent are the nations of the world in business affairs, even necessary if one's own country is going to enjoy the fullness of life.

The state as manager of industry was deprecated by Mr. Thorpe.

In business, he said, there must be rapidity of decision and this is impossible when a business is controlled by the Government, for in its working, there must be red tape, departmental reports, committees, etc., which do not tend to give rapidity to the conduct of affairs. We forget, he remarked, that the mechanism of the State is so arranged that it cannot make quick decisions. We over estimate what the Government can do in business affairs, and we under estimate the intricacies and interdependence of business in the modern world.

Speaking of the Labor Board set up by the United States Government about forty years ago, he stated that it had prevented thirteen strikes, not by itself only but just by stating the true facts of the dispute and spreading them over the newspapers of the country. Public opinion did the rest.

It is the willingness of German, French and English manufacturers in particular, to extend credit where credit is deserving, that has won for them their great markets in the past and is recovering them today, stated E. P. Chalfant, of New York, vice-president of the Gill Manufacturing Co.

Advice against using the foreign market as a dumping ground for shoddy goods or for surplus goods was stressed by C. R. Osborn, of New York, vice-president and general manager of the Overseas Motor Service Corp. He remarked that this tended to a distrust in American manufactured articles and also reflected on American business methods.

In a discussion following this address, Mr. Chalfant spoke of the need for a greater study of the credit question, explaining that it was in this matter that foreign nations scored over American manufacturers. He also referred to the great importance of adhering strictly to order specifications, as when not complied with, it meant greater expense and probably the loss of a good market.

W. T. Morris, vice-president of the American Chain Co., delivered an address entitled, "Putting good management at work in the automotive equipment industry."

German Machine Tool Market Responding to Efforts of American Manufacturers

Present year shows 20 per cent increase to date

In 1924, Germany imported 1,140 tons, or 1,874 units, of machine tools valued at 2,500,000 gold marks. The United States supplied the largest amount, followed in order by Switzerland and the Netherlands. It is probable that some of these imports listed as coming from the Netherlands also comprise American machines. This information is contained in the most recent report of the Department of Commerce.

Germany began to absorb metal-working machinery of foreign manufacture during 1924, in a slightly increased degree in comparison with other post-war years, and in the first half of 1925, it purchased machine tools from abroad at 75 per cent of the tonnage rate imported in 1913. Indications are that the German market for American machine tools is responding perceptibly to the efforts made by American manufacturers to re-establish themselves in this market.

A Healthy Growth

German imports of machine tools during the first six months of 1924 amounted to 473 metric tons. Such receipts during a corresponding period of the current year amounted to 2,400 tons, or 510 per cent of imports in the former period. In the consideration of the German market for machine tools, exports figures are also of importance, since sales of German machinery abroad affect the domestic demand for metal-working machinery in machine equipment factories. Germany is experiencing a healthy growth in its export trade in machine tools, as evidenced by comparative figures of the first six months of 1914 and 1925. Exports in the latter period were 120 per cent of those in the 1914 period.

Germany's export trade in machine tools has increased during 1925 as compared with 1924 by approximately 20 per cent in tonnage and 40 per cent in value, but at the same time the number of machines shipped has decreased by about 43 per cent. This would indicate that Germany is selling larger units of machines in foreign markets than in 1924—a fact which may be partially attributed to the strengthening of the financial position of the larger producers and manufacturers of heavy machinery. It also may be considered evidence that the small- and medium-size plants are losing ground against the larger enterprises formed by combinations and consolidations in the industry. Increases in production by these large plants have resulted in a greater demand for machine-tool equipment.

Machine-tool imports into Germany during the first six months of 1925 amounted to 2,400 tons, much greater than such imports in any year since 1920. German machine-tool imports in the first half of 1925 were five times as great in tonnage, nearly six times as great in number of units, and over seven times as high in value as in 1922, the peak year since the war began. The United States supplied 1,230 tons of the 2,400 mentioned, the next largest source of supply being Switzerland (220 tons) and the next Great Britain (200 tons).

The monthly average of 400 tons and 1,200,000 marks value per month for January to June, 1925, of Germany's imports was much exceeded in May and June and shows a further strengthening of the United States in the machine-tool market of Germany. The value of Germany's imports of machine tools in 1924 compared with its exports was only 4 per cent. During the first half of the current year, this figure has risen to more than 12 per cent.

Room for Expansion

American manufacturers are well represented in German territory by important machinery houses and experienced importers specializing in machine tools. Many desirable agents, however, are waiting to represent American manufacturers. The cultivation of the German machine-tool market by enterprising exporters of the United States has been the direct cause of America's increased participation in this trade, aided by a lively demand for highly efficient and up-to-date manufacturing tools.

Germany cannot hope to eliminate American imports of machine tools of a specialized nature for many years to come. Nevertheless the present boom of American sales to Germany offers an opportunity to sound an important warning to overzealous exporters and manufacturers. It is not wise to consider the present high volume of sales to Germany as a standard that can be improved upon at will by "high-pressure" salesmanship. The financial resources of the country will be taxed to the fullest extent by the next tax laws, the Dawes plan of reparations, and the repayment of many millions for American and other loans. A financial difficulty which may develop into a decided crisis and disorganization of the currency and a consequent slowing up of foreign purchases is possible.

American manufacturers should be warned against making unprotected credit extensions and the granting of consignment stocks on a large scale for long periods. Possible restrictive legislation against the exportation of foreign currency from Germany may be passed as a last attempt to hold together a currency otherwise greatly endangered by lack of visible imports and by unfavorable trade balances. There is nothing in the present situation to create any alarm, but conditions should be watched carefully and export business handled with conservatism.

Italy Favors Labor-Saving Machinery

Officials in Italy are coming to disregard such remaining sentiment as exists against labor-saving machinery. There was a time when a strong public opinion existed against machines that reduced the number to be employed. This feeling, however, is being supplanted by a more widespread understanding that business and employment conditions depend on the degree of general productivity. Increased imports of machinery are coming with this realization.

The war did much to bring American machinery to the favorable attention of the Italians. The Italian market is highly competitive, with France, Germany and England enjoying the many advantages of proximity. These nations usually are inclined to fight harder to maintain their position in the Italian market than the average American manufacturer of machinery is willing to fight to establish himself. Nevertheless, the amount of American machinery sold there is increasing.

The marked success of the Fiat enterprise and a number of other manufacturing activities has attracted national attention to the possibilities of modernly equipped businesses. It is interesting to note that two-thirds of the output of the Fiat plant is sold abroad. England is by far the largest purchaser of these cars, but sales in quantity were made last year to thirty-eight countries, while scattering shipments totalling 310 cars came under the "other countries" heading.

The industrial trend in northern Italy, together with the large program of public works in the South, present market possibilities to which the American manufacturer of machinery should not be blind.

The foregoing represents, in substance, observations by Henry C. McLean, the commercial attaché in Italy, who is in Washington for conferences with officials of the Department.

A.S.M.E. Meetings Will Take Up Many Urgent Problems

Honorary membership to be conferred on Secretary Hoover

The forty-sixth annual meeting of the A.S.M.E. will be held in New York City, from Nov. 30 to Dec. 4. Judging from the list of outstanding speakers and from the advance plans for technical sessions, the meeting will attract an attendance that will exceed the 1924 event, which was the largest the society ever held. The professional divisions have been at work on their programs in co-operation with the committee on meetings and program since April and efforts are being exerted to complete the program. About forty-five papers will be presented at the meeting.

One of the feature events of the meeting will be the presentation of honorary membership in the society to the Honorable Herbert Hoover and to past-president Worcester R. Warner. This event will take place on Tuesday evening, Dec. 1, just preceding the presidential address by Dr. William F. Durand.

An innovation at the meeting will be the delivery of the first Henry R. Towne and Robert Henry Thurston lectures. The Towne lecture will be given on Tuesday afternoon, Dec. 1, and will deal with the relation of engineering and economics. The Thurston lecture on engineering and science will be given on Thursday afternoon, Dec. 3. The lecturers are to be elected by council at the Altoona meeting of the society.

The business meeting will be featured by the usual council report and by an especially valuable report on the "Study of Mechanical Engineering Education." It will be followed by a general session at which each of the professional divisions will present reports of progress in their particular fields during the past year. These reports should be of tremendous value in establishing the research and standardization programs of the society.

The auditorium of the building will be used for the national defense session, when industrial leaders will report the progress that is being made in perfecting the national program of industrial preparedness.

Five Machine Shop Sessions

The renewal of activity in machine shop and machine design is demonstrated by the fact that there will be five sessions at this meeting. The topics to be discussed include—belt transmission, optical measurement, gears, machine tool design, spring design, lubrication, torsional stress in shafts, vibration in steam turbine buckets, and vibrations in shafts.

Two sessions are listed for management discussions—on industrial psychology, plant design, production control of newsprint manufacture, and fatigue. The Taylor Society is co-operating in this program.

The A.S.R.E. is co-operating in one session which will take up centrifugal compressors in two papers, one dealing with the centrifugal compressor as a refrigerating machine and the other discussing the heat balance of the centrifugal compressor.

The problem of materials handling will be discussed from the point of view of safety in one session. The aeronautics session will deal with the commercial possibilities of the airship and recent technical advances in aeronautics.

An important session will deal with training for industries and receive reports on apprenticeship abroad and apprenticeship in the building trades.

Fuel and power will be approached from more angles than usual. Industrial furnaces will be dealt with in one session. The oil and gas power session will take up transmission marine auxiliaries and large gas engines. Power plant materials will furnish the topic for a strong session at which steel castings, bolt materials, boiler tube corrosion, and refractories will be discussed. A general power session will deal with radiant heat absorption, the effect of steam bleeding and recent developments at the Colfax Station. The usual progress reports on the steam investigation and a public hearing on the power test codes will also be held.

Power and Mechanical Engineering to be Featured at Exposition in New York

A.S.M.E. and A.S.R.E. to co-operate

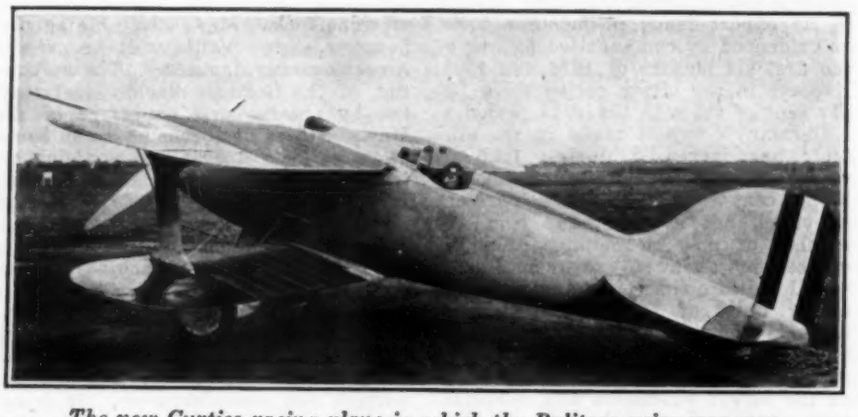
Practically all of the space at the Grand Central Palace has been contracted for by exhibitors at the Fourth National Exposition of Power and Mechanical Engineering to be held in New York, from Nov. 30, through to Dec. 5, 1925. It is expected that the coming show will present more than its usual quota of the newest devices and apparatus for use in the power plant of today.

One of the features of the show will be a series of lectures on the important developments in power and mechanical equipment during the preceding year. These are planned primarily for students but will be of general interest to mechanical engineers who wish to bring up to date their information on the development in all phases of mechanical engineering. The list of topics which have been selected for presentation by leading authorities includes: steam prime movers, oil and gas engines, steam boilers, modern industrial power plants, hydraulic machinery, machine tools, heating and ventilating equipment, mechanical refrigeration, mechanical power transmission, standardization, materials handling in the power plant, materials handling in industry and the steam locomotive.

The lectures will be scheduled to avoid conflict with the sessions at the annual meeting of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers, which will be held in New York during the week of the power show.

As most of the lectures deal with subjects that will be represented by exhibits at the power show, the combination of lectures and exhibits will furnish a valuable opportunity for securing available information on the important types of mechanical equipment. The show will have great educational value and the plan of lectures with the opportunities to study several concrete examples of the apparatus dealt with in each lecture will provide means for making this educational value available to those who use the Power Show for that purpose.

The lectures will be further supplemented by a series of attractive motion picture records of engineering achievement.



The new Curtiss racing plane in which the Pulitzer prize was won at a speed of 248 miles per hour

French Industry Awaits Stabilization

Outcome of debt funding conference at Washington brought some relief—Fear of higher taxation stifles trade expansion—Metal fabricating trades assured prosperity if free from outside competition—Skilled workers needed in many shops

By Our Paris Correspondent

ALL signs point to a general falling off of the economic and material aspects of French trade prosperity. With the admirable French resistance there may be a comeback sooner than is looked for. The fact is, however, that railway receipts are less than those of 1924, while government taxes collected actually show some twenty million francs less in receipts than a year ago by reason of having raised the base scale of taxation.

The debt funding check at Washington has brought a sigh of relief in some quarters and regret in others. There was a well-defined fear that M. Caillaux, with the powers conferred upon him, might have promised more than he could deliver, more than the elasticity of the French political, economic and financial régime of the immediate future could encompass. Forty million dollars per annum is quite another thing and though it may only be postponing fatality it will give general trade and manufacturers a chance to make a little money on the side if a new and too stringent taxation scheme is not put into immediate operation. This, M. Caillaux has threatened; the socialist element of parliament going even so far as to threaten, on their part, a capital levy. For the moment the matter rests there.

Accepts German Goods

There was never any hope of paying any part of the American debt in goods of any kind as there is with Great Britain. How that system works is shown plainly in the accepting by France of partial payments in kind from Germany. A recent report by the Prefect of the Department du Nord, referring to German payments in merchandise affecting the prosperity of his district, points out the fact that machine tools figured for five and a half million francs and textile machinery for seven millions to say nothing of other uncounted millions for transportation, brewery, distillery and print shop equipment and agricultural machinery. The total is represented by 142 separate contracts made by the French government with German manufacturers, totalling nearly thirty million francs.

The important Arbel establishment at Douai has closed one of its plants producing running gear and rolling stock. This is directly reported as being due to the placing of rolling stock orders in Germany, the recent order of the International Sleeping Car Co., which went to England, and the continued loss of foreign orders as a result of lower bids by German and Belgian makers. Germany has moreover succeeded in securing for the Vulkan Works an order for the construction of a 25,000-ton floating dock for Bordeaux. This is said to be but a forerunner of other big enterprises of a like nature which are soon to be placed.

If railway carriage and locomotive plants in general are having a hard time, those of naval constructions are slightly better off. The Worms Co. is building a fleet of colliers for northern French mines which have long coal contracts for Scandinavia. The Chantiers Navals Francais at Blainville is building a heavy-powered Diesel engined passenger boat for Brazil while the Chantiers de la Gironde has on the ways a 11,000-ton tanker for the Argentine government.

The Penhoet works of the Chantiers de Saint Nazaire has under way a new ocean greyhound for the French Transatlantic line. This plant is considered the peeer of its class in France, with a formidable equipment of machinery and tools of which a notable proportion are of American manufacture. The plant covers some eighteen acres and employs five thousand workmen.

Future Is Doubtful

Because of the low valued franc and the country's great potential mineral resources the metal fabricating trades have a certain assured future if dumping by outsiders plays no part. France will protect herself on this at home but fears what may happen in foreign markets where her exports are increasing daily in these lines.

The September cost index of minerals and metals rose from 550 in June to 577, while living costs went up to 390 from 386. Alone among non-ferro metals aluminum held its own at 1,105 francs per 100 kilos. Copper rose from 736 francs to 753 francs; tin from 2,965 to 3,077 francs; lead from 435 to 448 francs and zinc from 417 to 430 francs.

Engine and boiler imports into France have fallen off during the first eight months of the present year as compared with the same period in 1924. Of tools and hardware imports also fell from 55,496 metric tons to 28,944 tons. Machine parts fell from 17,637 tons to 13,893 tons, the inference being that less new equipment was being bought abroad with replace parts, proportionately, in greater demand.

Exports of the same items increased in every case. Tools and hardware totalled 329,709 tons, an increase of nearly 125,000 tons over last year. The valuation was well above a billion francs as compared with less than three quarters of a billion.

Tools and hardware from the United States did, however, increase to the value of 13 million francs during the period referred to, but engines and parts showed a fall of some forty millions, followed by their replace parts in a like proportion.

French tools saw their export to the United States increase but other items show reduced figures.

American exports to the principal European countries for the last fiscal year placed those to France in the third place, immediately after those of Great Britain and Germany, the total value being $288,893,686 as compared with $280,376,306 in 1924. Imports from France took second place, immediately after those of Great Britain and before those of Germany.

In spite of the above showing, which in so many respects is favorable to France, French export trade in all lines, except that of those famous "articles de Paris" in which there is so little competition, is about to enter a difficult period, wherein the new-born German competition will be more appreciably felt than formerly. The Franco-German commercial accord, adjourned from last spring, is still in abeyance and until this is settled France will hardly know what to expect from German trade policies either at home or abroad.

Skilled Mechanics Wanted

The labor market is in a confusing state. In spite of a general calm the government labor bureau announces that lathe hands, drillers and stampers are in demand in the Meurthe et Moselle district, electric machinery specialists in the Seine, general labor in the shipyards at Saint Nazaire and metal specialist workers at Nantes.

Of 1,784 foreign laborers brought into the country by the government labor bureau the last week in September, 129 went to the metallurgical industries, and 192 to the iron mines of the north. Of this total Italian labor predominated to the extent of 604, with Poles to the number of 262 and Spaniards to the number of 207, the rest being of various nationalities, notably Czecho-Slovaks. Just what these totals will mean at the end of a ten-year period, with female births increasing annually 4 per cent over those of males, anyone who understands the effects of race on a people and their traditions may readily figure out.

Since there are so few unemployed in France, and a continual and growing demand for foreign labor of the rougher kind, the question often crops up as to the virtues of the régime of the eight hour day. One writer in the *Journee Industrielle*, Paul Herbier, says frankly that the eight-hour day is a danger to French prosperity and may be abrogated. It is certain that metallurgists in general, others of the metal trades, shipyard operators and those of the electrical industries would favor a longer working day on a wage scale which would be more favorable than that provided for by the law of 1920.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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THE scene has shifted and Great Britain now holds the center of the economic stage. The leading character in the drama is the "Old Lady of Threadneedle Street," otherwise known as the Bank of England.

The plot is based upon the conventional mystery, with the *dénouement* as yet unrevealed. It concerns the ability of the "Old Lady" to withstand the drain of gold shipments to this country now going on at an accelerating pace. A secondary theme in the drama is the probable effect of these shipments on business in the United States.

The present gold movement has only started since the reduction of the Bank of England's discount rate two weeks ago from 4½ to 4 per cent. Already, however, these shipments have absorbed all the additional stock of gold accumulated by England since specie payments were resumed.

The repercussion in this country, although so far largely psychological, is becoming clearly evident. It has removed all fear of any immediate increase in the Federal Reserve discount rate and has been as strong wine to the bullish enthusiasts on the New York Stock Exchange. The speculative movement there has broken out afresh, with trading around 2,000,000 shares daily, and has carried many stocks to new high records.

This confidence of the stock speculators seems to be based primarily upon the unwarranted assumption that the Federal Reserve Board is obligated by agreement with the Bank of England to support the British gold standard. The corollary assumption is that Great Britain can continue indefinitely to export gold without endangering her gold standard.

The shipments thus far are insignificant compared with the total stock of gold in the United States. If continued for any length of time, however, they might have an inflationary effect on our credit structure, leading to unwise and dangerous expansion.

But how long can England maintain this outward flow of gold? Those who hold that she can do so indefinitely point to the fact that more than two-thirds of the world's gold supply is mined within the British Empire. But this argument is not conclusive. All the gold that Britain imports from South Africa or Australia must be paid for by British commodity exports just as if it came from the United States. Of course, South African gold can move to this country by way of England but this fact is irrevelant as long as the reserves of the Bank of England are declining.

Furthermore, no formal acknowledgment of the agreement between the Federal Reserve Board and the Bank of England has ever been published. Even if it does exist there is no reason for us to ignore the reserve strength of our own banks.

What's Doing in Industry

A conservative steadiness marks the trend of machine tool and machinery business during October. No appreciable increase in sales has been noticed in any locality, but there has been a better tone to the market, with new inquiries appearing from industries that have been buying sparingly in the past few months. This would seem to indicate that sales to be recorded in the last months of this year will assume substantial figures when the total is completed.

Detroit comes back this week with the report that the automotive industries are again buying, the demand being maintained at a satisfactory rate. Chicago reports a steady improvement, with small manufacturers leading in purchases. An upward curve in buying statistics comes from Cincinnati, and Indianapolis has been getting more business from the mining and automotive industries.

With general industrial activity increasing in upper New York State, Buffalo has experienced a slight increase in tool sales, with better prospects than in several weeks. Canada notices an improvement in demand, with the picking up of leading industries. Sales in New York continue to move at a fair rate, with export business beginning to assume normal proportions.

General business conditions throughout the country are good, but it is expected that there will be some deterrent reflection of the unsettled conditions in Europe this winter. The metal markets are buoyant and prices are on an upward trend.

The gradual decline in the reserve ratios of the Federal Reserve Banks, though almost imperceptible in week by week comparisons, is significant when viewed in the light of a year's changes. The combined ratio of the twelve banks is now down to 71.7 per cent, compared with 77.1 a year ago. The change is most noticeable in the Middle West and South, where the crop moving season is at its height. The reserve ratio of the Chicago district is 74.7 per cent as against 81.5 a year ago. Loans and discounts for the Chicago banks as a whole are now at the highest level in history. The Kansas City ratio has declined to 53.5 per cent from 68.2 at this time last year, and at Dallas the decline has been from 75.6 to 59.1.

Although these figures indicate nothing of an alarming nature for the present they do show that much of the former slack in our credit structure has been absorbed. It would be well, therefore, to keep an eye on our own reserve ratios as well as on position of the Bank of England.

Our foreign trade is another feature that should be watched. The balance in our favor for September is but $73,000,000 against $140,000,000 last year. Increased imports are the explanation. If they continue the psychological effect may be important.

The commodity markets may have been unconsciously reflecting the uncertainty of the conditions in Europe, for they have been dull and show but little change. Grain has rallied after the prolonged decline but corn and wheat are again turning downward.

All the leading metals are buoyant. Iron and steel prices have been marked up as a result of a better demand from the railroads and the large gain in unfilled orders shown by the U. S. Steel Corporation. Copper has apparently recovered from its recent slump and has turned up to 14⅝ cents a pound on the stimulus of strength in London.

These details are, however, comparatively unimportant. The important factors are the supply of credit and the rates paid for its use. Whenever the latter shall show that the former is contracting it will be wise to reconvert property into cash.

As this cannot be done instantly by everyone at the same time, those who are forehanded will not attempt to get the top. In Brazil where troops of monkeys cross a stream by making a chain of their bodies there is a proverb which asserts that the last monkey gets drowned. Its application to business under present conditions is obvious.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Buffalo

Reports on the machinery activity in Buffalo do not differ materially from those of a fortnight ago, except the tone of conditions is admittedly better. There is no doubt but that business is better than at any time since the first quarter of the year and some report better conditions than at any other time this year.

Except for railroads, with which activity in this region is dull, the pleasing factor is that the improvement is rather general. There are no big orders reported this week and no special line that is requiring extraordinary attention.

Some dealers reported that the actual volume of business they were doing was small, but that all salesmen reported practically all industries to be very busy. Many of these are bound to be in the market before the end of the year.

Hand to mouth buying still prevails, but inquiries are on the increase and in most cases machinery men are highly satisfied with conditions.

One machinery dealer specializing in electrical equipment reported that September was his biggest month in three years and that he expects the last quarter of the year to run 15 per cent ahead of the third quarter.

Cleveland

A slight slackening of sales of machinery and machine tools was noted for the past fortnight in the Cleveland district. Inquiries are plentiful, however, and local producers and dealers are confident that business will pick up in the near future. Automotive, railroads and industrials are the chief buyers at the present time.

The McKinney Steel Co. of Cleveland, is constructing five new mill buildings and a machine shop which will require considerable equipment of machinery.

Labor demands for fall and winter industries will maintain their present upward trend, according to an estimate by the American Plan Association. It is predicted that employment in machine shops will approach normal.

New York

Sales of machine tools and shop equipment continue at an even rate in this market. Nothing like a fall boom is being experienced by any local dealers or manufacturers' agents, but a substantial volume of orders has been recorded in the past ten days.

Business is spotty, new orders coming in from rather unexpected sources, and inquiries closing with less delay. Manufacturers of small tools, automobile accessories and hardware are busy and have found it necessary to come into the market for needed equipment.

Export business is a little better. Dealers who cater to foreign markets report a desire on the part of European buyers to secure American tool equipment, but the price and terms are often prohibitive. Russia has bought a few grinding machines, milling machines and lathes. Flour milling machinery, farm power equipment and other types are in great demand. The wheat crop in Russia has been very good this year, and it is expected that this will enable certain industrials to make necessary purchases of machine tools and shop equipment before the end of the year.

The price situation in this industry has changed but little of late. A few necessary advances were made, but as a rule present figures are as reasonable as can be expected.

The larger industrials have not been as active as was expected, their buying being confined to single orders for certain special types of machines as the necessity arises.

Indianapolis

A slight increase in the demand for machine tools is seen here. Some industrials are busier and are buying more readily. From present indications, the winter will be a good one for the automobile plants here. Two factories are working rather steadily and predict that production schedules will be increased before the first of the new year.

Machinery and tool demand from the farm implement factories in this state is low just at present. However, inquiries have been received which would indicate a resumption of business before the first of the year.

Business in the coal fields is good and quite a little mining machinery has been sold in the last month. Local dealers predict a continued business during the winter.

Demand for machinery for furniture factories continues fair. A good demand is reported from the lumber manufacturers, both in the South and West coast regions.

Cincinnati

A continued betterment of business conditions during the past week is reported by Cincinnati machine tool manufacturers. Practically all manufacturers of machine tools report an increased demand and the common feeling is that the sales-curve will continue to show a gradual ascent.

Selling agencies likewise report a better business tone, with less tendency to put off buying.

The automotive industries are again buying freely, after a lull of a week or ten days. Makers of automobile accessories have done considerable buying of small tools in the past week. Railroads have made some purchases of replacements, but no large orders are reported. Concerns in the electrical industries have done an increased amount of buying, but this has consisted mainly of replacements. Sales to the textile industry have increased slightly.

An increased volume of miscellaneous orders for replacements are reported to have been received from various sections, and in geographical respect the business is well distributed. An encouraging feature rests in the fact that there is a daily increase in the number of inquiries coming in from all sections and from all kinds of industries. The entire market tone is better, with a shorter lapse of time between inquiries and purchases.

Detroit

With production in the automobile factories being maintained at a peak never before experienced at this time of the year, the market for machinery and machine tools is reported by leaders in the field to be steady, with sales far ahead of those of the corresponding period last year.

Some companies report orders coming in faster than machinery previously ordered can be delivered. Some of the automobile factories, notably the Hudson Motor Car Co., are slackening up somewhat in purchases of equipment, but this is practically offset by the activity of the Ford Motor Co., and Dodge Brothers, Inc.

The demand for standard equipment and special machinery is practically on a fifty-fifty basis. There is a trend on the part of the automotive engineers to demand from the manufacturers types of machines which can be used for more than one purpose, rather than those whose peculiarities preclude their usage for other than one purpose.

There is quite a market for lathes, radial drills, screw machines, and upright drills.

Chicago

The tone of the local machine tool market continues to improve steadily, sales and inquiries during the last ten days justifying the general feeling of confidence, almost uniformly expressed by dealers, that the fall trade will reach satisfactory proportions.

The stability of the market is emphasized by the fact that industrial demand is extending to the smaller plants throughout the Middle West. Many of the small factories, working on short time during the summer months, or temporarily idle, are again operating, some of them to capacity, the result of enlarged production being an increasing number of inquiries for needed equipment. Manufacturers of furniture are experiencing much better business, and other woodworking plants are reacting favorably to improved trade conditions, a situation which makers of woodworking machinery are quick to feel.

Inquiries coming from the large industrial plants indicate a similar trade stimulation. Allis-Chalmers & Co. and the A. O. Smith Corporation, both of Milwaukee, are closing bids for additional equipment, as is also the Nash Motors Co., of Kenosha. The C. M. & St. P. R.R., and the N. Y. Central R.R. are also closing bids for machinery, the latter road including in its requirements a varied assortment of tools.

Canada

The demand for machine tools in Canada is showing a distinct improvement. Not only is buying on the upward trend, but there is a brighter tone to the entire market. The metal working industries are broadening out after the summer quietude. Rail orders are contributing greatly to the activity of the steel plants. Things are humming at Hamilton, Sault Ste. Marie and Sydney, the principal steel centers, to a greater extent than was the case a few weeks ago. Several hundred men have been taken on during the last few weeks at the various plants.

Reports from both Toronto and Montreal are highly encouraging. In the former city the metal markets during the last couple of weeks have been fairly active, with sellers gaining optimism as the volume of business picks up. A few large orders placed in Montreal have stimulated business in the larger engineering plants there, while these same orders will give work to a large number of small independents.

Dwight F. Davis Named Secretary of War

Dwight F. Davis, named Secretary of War to succeed John W. Weeks, has had a notable career as sportsman, soldier and politician. He has for years been an indefatigable advocate of "more playgrounds for the youth of the nation."

Mr. Davis, who is in his forty-seventh year, has been a foremost figure in the tennis world as champion player, donor of the famous Davis Cup and head of the United States Lawn Tennis Association.

As a major in the army, Mr. Davis fought with great gallantry in France, being cited for valor in the Argonne. He later became a lieutenant colonel.

In Missouri politics, Mr. Davis was a candidate for the Senate before he was appointed Assistant Secretary of

Photo by Underwood & Underwood

Dwight F. Davis

War, being defeated for the Republican nomination by Senator Selden P. Spencer in 1920. He was once boomed for Mayor of St. Louis, after having devoted years to building up the playground and public sport facilities of the city.

Mr. Davis was born in St. Louis, July 5, 1879. He took his A. B. degree at Harvard in 1900 and studied law in the Washington University Law School, taking his degree of LL.D. in 1903.

As a major he shared the fiery experience of the 35th Division in the first days of the Argonne battle, September 26-30, 1918. His citation, in general military orders, for bravery in the battle at Baulny, read:

"Major Dwight Davis, adjutant 69th Infantry Brigade, carried out the orders of his brigade commander in a manner utterly devoid of fear, under the most intense artillery and machine gun fire at Baulny on September 29 and 30. He recklessly exposed himself to the enemy fire to obtain information of great value to his brigade and division commanders."

Talk of Mr. Davis as a candidate for Mayor in 1921 was not encouraged by him. In the spring of that year he was appointed by President Harding as a director of the War Finance Corporation. Early in 1923 he was named Assistant Secretary of War.

Colonel MacNider Succeeds Davis in "Little Cabinet"

Colonel Hanford MacNider, of Iowa, former commander of the American Legion has been named Assistant Secretary of War to succeed Dwight F. Davis, who was sworn in on Oct. 14 as Secretary of War in place of John W. Weeks, resigned. The appointment turns the War Department over to two men from the Middle-West, both of whom had valuable military experience in the World War.

Colonel MacNider's nomination is gratifying to Secretary of War Davis, who issued the following statement after the appointment had been announced at the White House:

"I know Colonel MacNider only slightly, but everything I have heard of him is very fine and I regard the appointment as an excellent one. I am sure he will make a splendid official in the War Department, as he was a very capable national commander of the American Legion and he has had a broad business experience. The office of Assistant Secretary of War requires business ability and a knowledge of the military, and Colonel MacNider has both."

Colonel MacNider was born in Mason City, Iowa, October 2, 1889. When he assumes his new duties he will be the youngest member of what is generally known as "the President's little cabinet," and will probably be the youngest man who has held this important War Department post.

Colonel MacNider is the possessor of the Distinguished Service Cross, the Chevalier Legion of Honor and the Croix de Guerre. He was active in the organization of the American Legion, and in 1922 was elected its national head.

News of the Automotive Industry

Some manufacturers of motor cars are reported to be reducing their production schedules gradually, in accordance with the usual winter programs.

The Hudson Motor Car Co. has reduced its production from 1,300 a day to 900; Chrysler has made a 15 per cent reduction, and Dodge is producing about 850 cars a day, against a recent peak of 1,200.

Production by Ford, Packard and General Motors, however, continues at peak levels. The Ford Motor Co. is turning out cars at the rate of 150,000 for October, compared with 85,000 in September and 10,000 in August, when plans for the new Ford models went awry and interferred drastically with the scheduled output by this company. Both Ford and General Motors made changes in their models during the summer. The Packard company is said to be working on a sixty-day batch of unfilled orders, with enough orders on hand to provide capacity operation into December.

American manufacturers of automobiles have begun an inquiry to determine the feasibility of buying Government ships to transport their products to foreign markets. Emulating the example set by Henry Ford, other automobile manufacturers talk of acquiring fleets of their own. Among the concerns which have taken up the matter are the Hupp, Chrysler, Hudson and Dodge automobile companies. The foreign trade in automobiles, according to representations made to the Shipping Board, is growing so fast as to warrant American builders in operating their own ships to assure regular deliveries.

The South African commissioner of customs has ruled that the following automobile accessories, namely, tires, lamps, windscreens, speedometers, oil and gasoline gages, self-starters, buffers, and shock absorbers imported into the Union attached to automobile chassis are not classifiable as parts of the chassis but are dutiable separately under their appropriate tariff items, according to a cable received in the Department of Commerce on Oct. 12 from trade commissioner P. J. Stevenson, at Johannesburg. Exporters should, therefore, not include the value of such accessories in the value of the chassis when making up their invoices for shipments to South Africa. The different items with their values should be shown separately on the invoice. The importation of the above accessories permanently attached to the chassis will not, however, affect the duty on the chassis itself.

British automobile makers have had a good year which has added to their strength as well as emphasized certain weaknesses in their position. There were 512,909 cars registered in Britain last May and the number has been increasing at the rate of 5,000 a week since. Twice as many cars are registered today as four years ago.

The Detroit factory branch of the Nordyke & Marmon Co. reports increase of 98 per cent in September sales over September, 1924. The first nine months of 1925 have been one of the most successful periods, according to the Detroit factory branch.

The Stewart-Warner Corporation of Chicago, has introduced to the trade six new automobile accessories. They are a rail type heater, a radiator condenser, a new type spotlight, a carburetor and a shock absorber for Fords, and a "police special" motorcycle speedmeter.

The Nash Motors Co. of Detroit, has produced 5,000 Ajax sixes in the four months since production was started. Production of these cars is planned at the rate of 30,000 annually. The capacity of the Ajax plant will soon be doubled, work preparatory to installation of new machinery having already begun.

What the Railroads Are Doing

Freight traffic on the Pennsylvania Railroad System has been running at record breaking proportions since the beginning of September, and if coal were moving in a normal way the number of loaded cars handled would be unusually high. Even with coal moving below normal the number of loaded freight cars handled in the five weeks ended Oct. 3, which includes two days in August, amounted to 879,278, exceeding the similar period in previous years.

September earnings of the Atlantic Coast Line R.R. were well above those of last year, President Kenly announced last week, and loadings for October were promising large gains for the last quarter of the year.

The Youngstown Steel Car Co. has received an order to repair 1,000 steel cars for the Pennsylvania R.R. This, with other business pending, will likely enable the company to operate close to capacity through the winter.

The Pennsylvania R.R. has ordered repairs to 6,000 steel cars, divided 3,000 to the Ralston Steel Car Co. and 1,000 each to the Greenville Steel Car Co., the Buffalo Car Co. and the Youngstown Steel Car Co.

On Sept. 28 the Central Railroad of New Jersey made the first purchase of an oil-electric locomotive in America. This locomotive is the product of the combined efforts of the American Locomotive, the General Electric and the Ingersoll-Rand companies. The first locomotive of this type was completed eighteen months ago. Since then it has been demonstrated on various railroads in the East. This type of motive power lends itself to all classes of railroad service—passenger and freight hauling and car switching.

Personals

CHARLES A. SIMMONS, president of the Simmons Machine Tool Corporation, sailed for Europe on Oct. 17. Mr. Simmons will travel through England, France and Germany for about two months.

C. J. PRIEBE has become associated with the Ross Heater and Manufacturing Co., Inc., of Buffalo. Mr. Priebe has been assigned to the New York office of the company as sales engineer for the Metropolitan district. He was formerly a member of the editorial staff of the *American Machinist*.

MYRON A. LEE has been appointed head of the industrial engineering department of Cornell University. Professor Lee was formerly connected with the Gleason Works, Rochester.

G. A. GAFFERT has become instructor in mechanical engineering at the University of Illinois.

WILLIAM J. BRANDON, formerly mechanical engineer for the Avery Co., of Peoria, Ill., has taken charge of the new foundry for the Piston Ring Co., of Muskegon, Mich.

ELMER J. KOSKI has been transferred from the Cleveland to the Chicago office of the Warner & Swasey Co.

ALEXANDER WEISS has become machine designer for the Standard Seamless Tube Co., at Economy, Pa.

GEORGE A. GUERDAN has become instructor in machine design at the Stevens Institute of Technology.

GEORGE H. BAUER has been appointed manager of the Chicago office of the Foster Engineering Co., of Newark, N. J.

FRANK H. CLARK, well-known railway mechanical engineer, who for 14 years was superintendent of motive power for the Burlington system, has returned to China to resume his duties as technical advisor to the Minister of Communications of the Chinese government.

JOHN MULL, who has been special Indiana representative of the Davis Boring Tool Co., of St. Louis, is now associated with A. J. Heaney in the Book Bldg., Detroit.

GEORGE ROBERTS has been appointed Detroit Representative for the Foote Bros. Gear and Machine Co., of Chicago. His office will be at 576 Montclair Street.

DR. OSCAR VON MILLER, founder and director of the Deutsches Museum, of Munich, Germany, will visit the United States in November. It is the intention of the National Museum of Engineering and Industry in this country to entertain Dr. von Miller at a banquet to be held in the Engineering Societies Building, New York City, shortly after his arrival. Samuel Insull, president of the museum, will have charge of the ceremonies.

A. M. BISSIKUMMER has resigned as assistant superintendent of the machine department of the American Locomotive Co., at Dunkirk, N. Y. He had been associated with this company for twenty-eight years.

F. E. MCKEE has resigned as vice-president and general manager of the Campbell, Wyant & Cannon Foundry Co., of Muskegon, Mich.

G. H. BLAKER has been appointed sales manager of the Anderson Engineering and Foundry Co., of Anderson, Ind.

T. R. COATES has been appointed general manager for Canada, for Henry Disston and Sons, Ltd., Toronto, following the retirement of S. Y. Dingle, who was with the company for 45 years both in the Philadelphia and Toronto plants.

J. D. JONES, director and general manager of the Algoma Steel Corporation, has been appointed a vice-president; and J. W. Wilson, former assistant general superintendant has been appointed general manager.

F. S. HARTWELL has resigned as general toolroom foreman of the Texas and Pacific R.R., to take charge of the western New York sales territory of the Davis Boring Tool Co. of St. Louis. He will have offices at 831 James St., Rochester, N. Y.

G. A. MONTGOMERY, president of the Algoma Eastern Ry., has assumed the office of general manager.

F. M. DONEGAN has been appointed superintendent of the Algoma Eastern Ry.

JOSEPH N. SHENSTONE, has been elected president of the Massey-Harris Co., Ltd., succeeding Vincent Massey, who recently resigned upon being appointed a minister of the federal government in Canada. Mr. Shenstone has been with the company for more than 40 years in various capacities, and has been vice-president and chairman of the board of directors.

THOMAS BRADSHAW, who has been general manager of the Massey-Harris Co. Ltd., has been appointed vice-president and general manager.

DEAN K. CHADBOURNE has been appointed general manager of the Westinghouse Electric International Co., to succeed E. D. Kilburn who was recently elected vice-president of the Westinghouse Electric and Manufacturing Co. Mr. Chadbourne was for six years connected with the Chicago office of the Allis-Chalmers Co., and then became district manager of the George Cutter Co., of South Bend, Ind. In 1920 he joined the Westinghouse Electric International Co., and was made manager of the Far-Eastern department.

W. E. DAVIS, who has been connected with the Chevrolet Motor Car Co., in its Detroit offices, has been appointed production manager of the Buffalo, N. Y., plant of the company. He succeeds E. J. Maxwell who comes to Detroit to be connected with the home office.

L. W. LONGAN has been placed in charge of the silent chain department of the Link-Belt Co., in Detroit, succeeding G. L. McCain.

Obituaries

MATHEW PHINEAS H. R. SANKEY, a prominent member of several British engineering societies, and also a member of the American Society of Mechanical Engineers, died at the age of 71 on Oct. 3, in England. Mr. Sankey was a past president of the Institution of Mechanical Engineers (English), and was for many years a director and designer for Williams & Robinson, Ltd., of Rugby.

FRANKLIN TOWNSEND, vice-president and general manager of the Townsend Furnace and Machine Shop, of Albany, N. Y., died at his home in that city on Oct. 12. He was 46 years old.

JAROME C. DIETRICH, founder and president of the Shurly-Dietrich Co., Ltd., of Ontario, Canada, died on Oct. 6. He was 88 years old.

Business Items

The Tool Equipment Sales Co., of Chicago, has been appointed the exclusive factory representative of the New Process Twist Drill Co., of Taunton, Mass., for the Chicago territory. The Tool Equipment Sales Co. will carry a complete stock of both carbon and high-speed steel drills in the Chicago store.

The Weir Kilby Corporation is the new name of the consolidation recently completed by the Weir Frog Co., of Cincinnati, and the Kilby Frog and Switch Co., of Birmingham. O. DeG. Vanderbilt, Jr., is president of the new organization.

The American Engineering Co., of Philadelphia, announces the following representatives for the sale of its "Lo-Hed" electric hoist: the All-Steel Equipment Co., Albany, N. Y.; the American Machinery and Supply Co., Omaha, Neb.; Ambler & Riter, Salt Lake City, Utah; the Dravo-Doyle Co., Cleveland; the Factory Supply Co., Inc., Birmingham, Ala.; the C. Fuson Co., Memphis, Tenn.; Gibbens & Gorden, Inc., New Orleans, La.; the Industrial Products Corporation, Pittsburgh, Pa.; Menner & Kimball, St. Louis, Mo.; the Standard Steel and Supply Co., Ashland, Ky.; the C. Turner & Co., Chattanooga, Tenn.; S. R. Vanderbeck, Philadelphia, Pa.; Wylie Brothers, Oklahoma City, Okla.

The Robert June Engineering Management Organization, of Detroit, has acquired control of the Electric Flow Meter Co., of Kansas City, Mo., formerly the Hyperbo-Electric Flow Meter Co. of Chicago, and will henceforth operate the business under its own management with executive offices at 8835 Linwood Ave., Detroit.

Calendar of Local Meetings

National Association of Cost Accountants

New York Chapter. Nov. 10. "The Elements of Standard Costs," by G. Charter Harrison.

Albany Chapter. Nov. 11. Description of manufacturing methods and discussion of general accounting scheme and accounting methods.

Worcester Chapter. Nov. 12. "Mechanical Appliances—Their Uses and Costs."

Philadelphia Chapter. Nov. 13. "Relation of Sales Quotas and Credits to Production and Costs," by J. W. Hallman.

Mohawk Valley Chapter. Nov. 16. "Materials Budget, or Costing the Materials."

American Society of Mechanical Engineers

American Society of Mechanical Engineers, Philadelphia. Oct. 27. Elks' Club. Subject: "Engineers in Wall Street," J. G. Hatman, secretary, the Barrett Co., Frankford, Philadelphia.

Utah. Oct. 28. Chamber of Commerce. Subject: "Economical Steam Generation."

Metropolitan. Enginbering Societies Building. Subject: "Household Engineering."

Hartford. Nov. 3. Hartford Engineers' Club. Subject: "Production Problems in Fire Arms Manufacture." E. D. P. Gross, secretary, Hartford Electric Light Co.

Metropolitan. Nov. 12. Engineering Societies Building. Subject: "Subterranean Heat as a Source of Energy." Speakers: L. P. Breckenridge, George Otis Smith and J. D. Galloway.

Forthcoming Meetings

Management Week. Conducted jointly by five societies—The American Society of Mechanical Engineers, The American Management Association, The National Association of Cost Accountants, The Taylor Society and the Society of Industrial Engineers. Week of Oct. 19 to 24. W. L. Conrad, of the A. S. M. E., is chairman of the joint committee.

American Welding Society. Exposition of welding equipment and accessories, Massachusetts Institute of Technology, Cambridge, Mass., Oct. 21, 22 and 23. R. L. Browne, chairman, 141 Milk St., Boston, Mass.

National Association of Manufacturers. Annual convention, Hotel Statler, St. Louis, Mo., Oct. 26, 27 and 28. George S. Boudinot, secretary, 50 Church St., New York.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., 29 West 39th St., New York City, Nov. 30, to Dec. 4. Calvin Rice, secretary, Engineering Societies Bldg., New York.

National Exposition of Power and Mechanical Engineering. Fourth annual event, Grand Central Palace, New York City, Nov. 30 to Dec. 5. Charles F. Roth, manager, International Exposition Co., Grand Central Palace, New York City.

American Association for the Advancement of Science. Annual meeting, Kansas City, Mo., Dec. 28, 1925, to Jan. 2, 1926. Barton E. Livingston, secretary, Smithsonian Institute Bldg., Washington, D. C.

American Society for Steel Treating. Winter sectional meeting, Hotel Statler, Buffalo, N. Y., Jan. 21 and 22. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Pig iron advancing steadily because of higher coke prices. Considerable foreign iron and steel coming into the market. Most of the iron buying confined to small lots for prompt shipment. Steel bars and shapes increasing in firmness, with mill quotations at $1.90@$2 per 100 lb., Pittsburgh. Slight weakness still prevails in plates, galvanized sheets, and cold finished steel. Plates quoted at $1.70@$1.90 per 100 lb., f.o.b. mill.

Non-Ferrous Materials—With the exception of lead, the non-ferrous metals market is on the up-trend. Lead is quoted to date at the Oct. 9 level. Copper rose ¼c.; zinc, ¼c.; antimony, ½c.; and tin, ¾c. per lb. in New York warehouses during the week. Wiping cloths are firmer. Linseed oil is down 2c. per gal. in Chicago.

(All prices as of Oct. 16)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$23.05
Northern Basic	22.27
Southern Ohio No. 2	22.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	27.37
BIRMINGHAM	
No. 2 Foundry	20.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.26
Virginia No. 2	29.17
Basic	21.16
Grey Forge	....
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.77
Basic	20.77
Bessemer	20.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.50
Cleveland	4.90@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.25@2.30	3.89	3.00	3.50
No. 12	2.30@2.35	3.94	3.05	3.55
No. 14	2.35@2.40	3.99	3.10	3.60
No. 16	2.45@2.50	4.09	3.20	3.70
Black				
Nos. 17 to 21	4.00	4.15	3.60	3.80
Nos. 22 to 24	4.05	4.20	3.65	3.85
Nos. 25 and 26	4.10	4.25	3.70	3.90
No. 28	4.20	4.35	3.80	4.00
Galvanized				
Nos. 10 and 11	2.05@2.15	4.35	4.00	4.00
Nos. 12 to 14	2.15@2.25	4.45	4.10	4.10
No. 16	2.30@2.40	4.60	4.25	....
Nos. 17 to 21	2.45@2.55	4.75	4.40	4.40
Nos. 22 to 24	2.60@2.70	4.90	4.55	4.55
No. 26	2.75@2.85	5.05	4.70	5.70
No. 28	3.05@3.15	5.35	4.95	4.00

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
3½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameters Inches — External	Diameters Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼ in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.15	50%	⅞	$0.18	35%
⅜	.16	45%	1	.19	31%
½	.17	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.30 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	....	4.00@4.65
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.05	....	....
Hoop steel	4.49	3.85	4.15
Cold rolled strip steel	6.35	8.25	6.80
Floor plates	5.55	5.60	5.50
Cold drawn shafting or screw	4.15	3.80	3.60
Cold drawn flats, squares	4.65	4.30	4.10
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.10
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.40	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	60%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York				15.25
Tin, 5-ton lots, New York				63.50
Lead (up to carlots) E. St. Louis	9.25	New York	10 25	
Zinc (up to carlots) E. St. Louis	8.30	New York	9.25	

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	18.50	19.75	....
Copper sheets, base	22.75	22.75	22.75
Copper wire, base	20.25	17.00	16.75@17.00
Copper bars, base	21.87½	21.50	21 87½
Copper tubing, base	24.75	25.50	24.75
Brass sheets, base	19.12½	19.00	19.12
Brass tubing, base	23.75	23.75	23 75½
Brass rods, base	16.87½	16.87½	16.87
Brass wire, base	19.62½	22.50	19.62½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1–15 ton lots	28.00	28.00	28.03
Zinc sheets (casks)	11.25	12.00	11.52
Solder (½ and ½), (case lots)	39.50	39.00	38@42
Babbitt metal (83% tin)	60.00	70.75	58@63
Babbitt metal (35% tin)	28.00	22.50	30@35
Nickel (ingots) f.o.b. refinery	31.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	38.00	.....	.....
Nickel (shot) f.o.b. refinery	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00
Cold rolled sheets (base)			50 00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	12.25@12.50	11.50	12.00@12.50
Copper, heavy, and wire	11.75@12.00	11.25	11.50@12.00
Copper, light, and bottoms	10.00@10.25	9.50	10.25@10.75
Heavy lead	8.00@ 8.37½	7.50	7.75@ 8.25
Tea lead	6.50@ 7.00	4.50	6.50@ 7.00
Brass, heavy, yellow	7.25@ 7.50	7.00	7.75@ 8.25
Brass, heavy, red	9.50@10.00	....	8.75@ 9.25
Brass, light	6.25@ 6.50	6.00	7.25@ 7.75
No. 1 yellow rod turnings	8.00@ 8.50	9.25	7.50@ 8.00
Zinc	4.75@ 5.50	4.25	4.50@ 5.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$11.25	$11.45	$11.50
"A" Grade:				
IC,	14x20	8.85	9.40	9 50
	Coke Plates—Primes.			
100-lb.,	14x20	6.50	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.95	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.15@0.22	$0.19	$0.20
Cotton waste, colored, per lb.	.10@ .15½	.18	.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15½
Sal soda, per 100 lb. keg	2.25	2.25	2.75*
Roll sulphur, per 100 lb. keg	3.75	3.75	4.50
Linseed oil, per gal., 5 bbl. lots	1.04½	1.15	1.01
Lard cutting oil, 25% lard, per gal.	.55	.50	.72
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.35	.35	.26
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40%	40%	30–10%
Heavy grade	30–10%	35%	30–5%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

*In 175 lb. kegs.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.0415	.0415	.0405
Brass rods	per lb	.1687½	.1687½	.1462½
Solder (½ and ½)	per lb.	.395	.395	.37@.38
Cotton waste	per lb.	.15@.22	.15@.22	14@21
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.55	3.55	3.38
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.29
Belting, leather, medium	off list	40%	40%	40–2½%
Machine bolts up to 1x30 in.	off list	40%	40%	50%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.46	$5.84	$5.00
Emery paper	10.71	11.00	11.90
Emery cloth	29 48	31.12	32.75
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.41	1.40
Cloth	3.55	2.67	3.55
Fire clay, per 100 lb. bag		.60	.75
Coke, prompt furnace, Connellsville	per net ton		3.50@4.00
Coke, prompt foundry, Connellsville	per net ton		4.75@5.25
White lead, dry or in oil	100 lb. kegs		New York, 13 75
Red lead, dry	100 lb. kegs		New York, 15.75
Red lead, in oil	100 lb. kegs		New York, 17.25

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1½x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%. Machine bolts, up to 1x30-in., with cold punched and hot-pressed hex. nuts, also button head bolts with hex. nuts are $3.60@3.75 per 100 lb. at Cleveland.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{5}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses; with hex. heads, $4.65 per 100 lb. net at Chicago.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for $\frac{5}{16}$-in. and smaller and 65% for ⅜-in. and larger.
Case hardened ½x½-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam.x2$\frac{1}{16}$-in. to 4½-in., $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅜-in. dia., 35c.; ½-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅜-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ariz., Inspiration—Anaconda Copper Co., 25 Broadway, New York, N. Y., Purch. Agt. electric crane, 30 ton 43 ft. c.c. rails, for Inspiration Copper Co. plant, Inspiration, Arizona.

Calif., Berkeley—Steel Pipe & Tank Co., 1100 4th St.—five cranes 5 to 10 ton for shop buildings.

Calif., El Monte—El Monte Union High School District, J. D. Cleminson, Clk., will receive bids for 2 motor driven wood turning lathes.

Conn., Greenwich — Putnam Corp., 23 West Putnam Ave.—small garage tools and motors for proposed 115 x 205 ft. garage. Estimated cost $150,000.

Ind., South Bend — Studebaker Corp., Main and Bronson Sts.—traveling crane and equipment for proposed 1 story, 124 x 382 ft. spring factory including craneway. A. Kahn, 1000 Marquette Bldg., Detroit, Mich., Archt.

Mass., Boston—Jackson Door & Window Co., 95 Canal St.—additional equipment for factory extension at Everett.

Mass., Cambridge (Boston P. O.)—F. W. Dixon, 3 Dock St., Kendall Sq.—20 in. back-geared drill and No. 2 Universal miller.

Mass., South Boston (Boston P. O.)—B. Stephens Sons., 113 A St.—36 in. band saw, 12 to 16 in. buzz planer, 24 to 30 in. heavy single surface planer, multiple spindle wood borer 8 to 16 spindles, 25 hp. alternating current motor.

Mich., Deerfield — The Cooper Steel Spring Co., Detroit, G. W. Cooper, Pres.—dies and equipment for proposed new plant for the manufacture of steel springs here.

Mo., St. Louis — Wabash Railway Co., Railway Exchange Bldg., St. Louis, Mo., T. J. Frier, Purch. Agt.—two 25 ton overhead traveling cranes for Decatur, Ill. shops.

Mo., Valley Park—Barbour Boat Co.—drum sander.

N. Y., Buffalo—Houde Engineering Corp., 237 Winchester Ave.—lathes and equipment for proposed metal products factory. Estimated cost $50,000.

N. Y., New York—M. Max, 206 West 29th St.—Wright planer.

O., Cleveland—Cyril J. Bath & Co., East 70th St. and Machinery Ave.—48 x 48 in. x 16 ft. 3 or 4 head heavy pattern planer.

O., Columbus—Ohio Motors Co., 5th and Capitol Sts., H. E. Whitney, Service Mgr.—combination drill press machine, shaper and other machinery.

Pa., Hartstown—W. P. West—drill press, small lathe, cylinder reboring machine and air compressor.

R. I., Pawtucket—School Committee—manual training equipment including metal working machinery for new $1,000,000 high school.

Va., Roanoke—The Norfolk & Western Railway Co.—C. Cocke, Purch. Agt.—large list of machine tools including engine lathes, milling machines, crank shapers, threading machines, grinders, etc.

Wis., Oshkosh—Wisconsin Parts Co., 571 High St.—electric crane.

Ont., Strathroy — Canadian Turner Day Handle Co., W. Jackson, Gen. Mgr.—additional woodworking machinery for the manufacture of handles and wood products to increase capacity of plant. Estimated cost $25,000.

Que., Montreal—H. J. Knox, 393 Mance St.—complete equipment for automobile repair and service garage at 415 Aylmer St.

Opportunities for Future Business

Calif., Berkeley — Hall Scott Motor Co. Inc., awarded contract for the construction of a 1 story factory for the manufacture of marine and air motors, Rucksteel axles for Fords and Fageol bus engines at Snyder and 5th Sts. Cost $15,000.

Calif., Berkeley—Steel Pipe & Tank Co., 1100 4th St., has had plans prepared for the construction of a 4 story factory. Estimated cost $40,000. Company engineers in charge.

Calif., Oakland—Diamond "G" Co., c/o R. H. Green, 432 Lincoln Ave., Alameda, plans the construction of a 1 story factory for the manufacture of electrical specialties at 24th and Magnolia Sts., here. Estimated cost $10,000.

Calif., Oakland—Laher Auto Spring Co., 714 East Pike St., Seattle, Wash., awarded contract for the construction of a 1 story factory at 26th and Magnolia Sts., here, Cost $43,000.

Calif., San Francisco — Acme Planing Mills, 1899 Bryant St., will build a 1 story planing mill at Flower and San Bruno Aves. Estimated cost $9,500.

Calif., San Francisco — Electric Storage Battery Co., 1536 Bush St., is having plans prepared for the construction of a 1 and 2 story factory at 3rd St. and Paul Ave. Estimated cost $125,000. H. H. Meyers, Kohl Bldg., Archt.

Calif., San Francisco—State Board of Harbor Commissioners, Ferry Bldg., is having plans prepared for the construction of a warehouse, garage, carpenter shop, etc., on Seawell St. Estimated cost $200,000. F. G. White, Ferry Bldg., Ch. Engr.

Conn., Hartford — One Hundred Eighteenth Connecticut National Guard, is having preliminary plans prepared for the construction of a 1 story armory, including machine shop, etc. at Brainard Field. Estimated cost $60,000. Payne & Keefe, Manwaring Bldg., New London, Archts.

Conn., Hartford — Spencer Turbine Co., 484 New Park Ave., will build a 2 story, 43 x 152 ft. factory for the manufacture of organ blowers. Estimated cost $50,000. Noted Aug. 6.

Ill., Chicago — International Furniture Co., 2127 South Racine Ave., awarded contract for the construction of a 4 story, 50 x 116 ft. addition to factory. Estimated cost $100,000. D. S. Klafter, 64 West Randolph St., Archt.

Ill., Mendota — H. D. Conkey & Co. awarded contract for the construction of a 1 story, 90 x 140 ft. factory for the manufacture of cranes, hoists, etc. Estimated cost $50,000.

Ia., Cedar Rapids — University Crusher Co., Cedar Rapids, awarded contract for the construction of a 1 story, 40 x 100 ft. machine shop.

Mass., Atlantic (Boston P. O.)—Norfolk Woodworking Co., Braintree, will soon receive bids for the construction of a 1 story, 140 x 260 ft. cabinet shop here. Estimated cost $200,000. L. S. Joslin, 339 Newbury St., Boston, Archt. Noted Sept. 10.

Mass., Dorchester (Boston P. O.) — Thompson Wire Co., 42 Mildred Ave., awarded contract for the construction of a 1 story addition to factory. Estimated cost $40,000. Noted Oct. 8.

Mass., Framingham — Manufacturing Equipment & Engineering Co., Marble St., awarded contract for the construction of a 1 story, 60 x 200 ft. factory. Estimated cost $50,000. Noted June 18.

Mass., Lowell—Boston Auto Supply Co., 96 Bridge St., is receiving bids for the construction of a 1 story, 45 x 212 ft. supply and repair shop on First St. Estimated cost $40,000.

Mass., Newton (Boston P. O.)—Newton Machine Screw Co., 10 Crafts St., Newtonville, will build a 1 story, 40 x 100 ft. machine shop at 227 California St., here. Private plans.

Mass., Westfield—H. B. Smith Co., 640 Main St., Cambridge, is receiving bids for the construction of a 1 story, 111 x 210 ft. machine shop here. French & Hubbard, 210 South St., Boston, Engrs.

Mich., Dearborn—Ford Motor Co., Highland Park, is receiving bids for a 1 story, 201 x 318 ft. extension to shop and laboratory building at Oakwood Blvd. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

Mich., Detroit—Weston & Ellington, 1507 Stroh Bldg., Archts., will receive bids until Oct. 30 for the construction of a 3 story, 160 x 198 ft. garage and service station at Smith and Noble Sts., for Detroit City Gas Co., Clifford St. and Bagley Ave. Estimated cost $150,000.

Mo., St. Louis—William Murdack Electric Mfg. Co., 21 South 11th St., is having preliminary plans prepared for the construction of a plant for the manufacture of switchboards, etc., on Clayton St.

N. J., Bloomfield — Westinghouse Lamp Co., 150 Broadway, New York, N. Y., is having plans prepared for the construction of addition to plant here. Estimated cost $90,000. Private plans.

N. J., Florence—Florence Pipe Foundry Machine Co. awarded contract for the construction of addition to foundry. Estimated cost $100,000.

N. Y., New York — Packard Motor Car Co., Broadway and 61st St., plans the construction of a repair and service garage on East Fordham St. Estimated cost $150,000.

O., Cleveland—Electrical Mfg. Co., 4149 East 79th St., awarded contract for the construction of a 1 story, 81 x 108 ft. addition to factory. Estimated cost $40,000.

O., Marietta — Safe Cabinet Co., E. W. Hopp, Gen. Mgr., will soon award contract for the construction of a 4 story, 80 x 700 ft. factory. Estimated cost $400,000. Schenck & Williams, Mutual Home Bldg., Dayton, Archts. Noted Sept. 17.

Pa., McKees Rocks—Pittsburgh & Lake Erie R.R., Southfield St., Pittsburgh, awarded contract for the construction of a 2 story lacquer building. Estimated cost $40,000.

Pa., Pittsburgh — Clinton Iron & Steel Co., West Carson St., awarded contract for the construction of a slag crushing plant, 250 ton steel. Estimated cost $50,000.

Pa., Pittsburgh — Pittsburgh Crucible Steel Co., Oliver Bldg., will build a 1 story addition to steel plant at 31st and Smallman Sts. H. J. Woods, c/o owner, Engr.

Wis., Marshfield—Wisconsin Butter Tub Co., West 9th St., awarded contract for the construction of a 2 story addition to factory. Estimated cost $40,000. Noted Oct. 1.

Wis., Oshkosh—Wisconsin Parts Co., 571 High St., awarded contract for the construction of a 1 story, 62 x 185 ft. addition to factory. Estimated cost $50,000.

Wis., Two Rivers—Aluminum Goods Mfg. Co., Manitowoc, is having plans prepared for the construction of a 5 story, 75 x 148 and 56 x 75 ft. warehouse and factory. Estimated cost $200,000. Lockwood Greene & Co., 400 North Michigan Ave., Chicago, Ill., Engrs.